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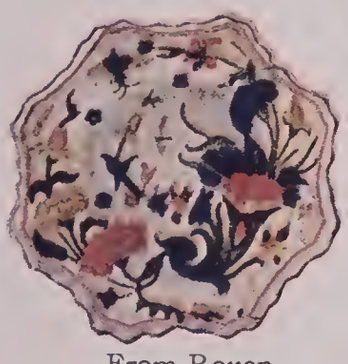
Old German Jug



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Modern English Faience

Modern French Faience

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SCHEME OF SOUND SYMBOLS

FOR THE PRONUNCIATION OF WORDS.

Note.—(-) is the mark dividing words respelt phonetically into syllables; (′), the accent indicating on which syllable or syllables the accent or stress of the voice is to be placed.

Sound-symbols employed in Respelling.	Representing the Sounds as exemplified in the Words.	Words respelt with Sound-symbols and Marks for Pronunciation.
ā	mate, fate, fail, aye	*māt, fāt, fāl, ā.*
ă	mat, fat	*măt, făt.*
â	far, calm, father	*fâr, kâm, fâ′thėr.*
ä	care, fair	*cär, fär.*
aw	fall, laud, law	*fawl, lawd, law.*
ē	mete, meat, feet, free	*mēt, mēt, fēt, frē.*
ĕ	met, bed	*mĕt, bĕd.*
ė	her, stir, heard, cur	*hėr. stėr, hėrd, kėr.*
ī	pine, ply, height	*pīn, plī, hīt.*
ĭ	pin, nymph, ability	*pĭn, nĭmf, ă-bĭl′ĭ-tĭ.*
ō	note, toll, soul	*nōt, tōl, sōl.*
ŏ	not, plot	*nŏt, plŏt.*
ô	move, smooth	*môv, smôth.*
ō	Goethe (similar to *e* in her)	*gō′tėh.*
ow	noun, bough, cow	*nown, bow, kow.*
oy	boy, boil	*boy, boyl.*
ū	pure, dew, few	*pūr, dū, fū.*
ŭ	bud, come, tough	*bŭd, kŭm, tŭf.*
û	full, push, good	*fûl, pûsh, gûd.*
ü	French plume, Scotch guid	*plüm, güd.*
ch	chair, match	*chär, măch.*
ċh	German buch, Heidelberg, Scotch loch (guttural)	*bôċh, hī′dėl-bĕrċh, lŏċh.*
g	game, go, gun	*gām, gō, gŭn.*
j	judge, gem, gin	*jŭj, jĕm, jĭn.*
k	king, cat, cot, cut	*kĭng, kăt, kŏt, kŭt.*
s	sit, scene, cell, city, cypress	*sĭt, sēn, sĕl, sĭt′ĭ, sī′prĕs.*
sh	shun, ambition	*shŭn, ăm-bĭsh′ŭn.*
th	thing, breath	*thĭng, brĕth.*
th	though, breathe	*thō, brēth.*
z	zeal, maze muse	*zēl, māz, mūz.*
zh	azure, vision	*ăzh′ėr, vĭzh′ŭn.*

ELUDE, v. *ĕ-lôd′* [F. *éluder*—from L. *eludĕrĕ*, to mock, to deceive—from *e*, out of; *lūdo*, I play: It. *eludere*]: to escape; to shun; to evade; to avoid by artifice; to escape being seen. ELU′DING, imp. ELU′DED, pp. ELU′DIBLE, a. *-dĭ-bl*, capable of being eluded. ELU′SION, n. *-lô′zhŭn* [L. *elūsŭs*, mocked, deceived]: escape by artifice; evasion. ELU′SIVE, a. *-zĭv*, deceptive; using arts to escape. ELU′SIVELY, ad. *-lĭ*. ELU′SORY, a. *-zėr-ĭ*, tending to elude or deceive; deceitful; evasive.—SYN. of 'elude': to escape; avoid; eschew; flee; mock; baffle.

ELUL, n. *ē′lul:* sixth month of the Jewish ecclesiastical, and the twelfth of the Jewish civil, year. It begins with the new moon of September.

ELUTRIATE, v. *ĕ-lô′trĭ-āt* [L. *elūtrĭātus*, washed out, decanted—from *e*, out of; *lūtŭs*, washed]: to purify by decanting or straining off; to cleanse by washing. ELU′TRIATING, imp. ELU′TRIATED, pp. ELU′TRIA′TION, n. *-ā′-shŭn*, process of separating, by means of water, the finer particles of earths and pigments from the heavier and metallic portions. The apparatus generally used is a large vat, in which grinding wheels revolve, and the substance to be reduced to powder being placed in the vat with water, the wheels in revolving not only pulverize the material, but from their motion being communicated to the water, the latter is enabled to retain in mechanical suspension the finer particles of the clay, etc. By allowing a stream of water to flow in and out of the vat, the finer particles can be constantly floated away, and the liquid being run into settling vats, the fine powder settles to the bottom, when the water can be run off from the surface. This process is usual in preparing pigments and the materials used in pottery.—In some cases the elutriation is caused by a blast of air which is drawn over the dry, powdered material, the larger particles are carried away a short distance, the finer ones are transported over a longer space; in this manner a rather complete separation of the various sized fragments can be accomplished.

ELUXATION, n. *ē-lŭks-ā′shŭn:* dislocation or pulling out of joint of a bone.

ELVAN, a. *ĕlv′ăn* [see ELF]: pertaining to elves. ELVAN COURSES, or ELVANS, veins of a granular crystalline mixture of felspar and quartz, probably proceeding from a granite mass, which are found in granite rocks and fossiliferous slates in Cornwall, Devon, and the s. of Ireland.

ELVAS, *ĕl-vâs:* episcopal city and fortress of Portugal, in a very fruitful district on the e. frontier of the province of Alemtejo, 10 m. w. of Badajoz, 40 m. n.e. of Evora. It is the strongest fortress in Portugal, and one of the strongest in Europe. The chief manufactures are arms and jewellery. Here are extensive store-houses filled with British manufactures, and the inhabitants, by illegally selling these goods within the Spanish frontier, gain large profits. Pop. 10,471.

Elvas has undergone many sieges, but has never been taken. The Spaniards besieged it 1385, and again 1659, when a famous battle took place called the Lines of Elvas, in which the Portuguese, though greatly inferior in numbers, drove the Spaniards from their lines in front of the town.

ELY, *ē'lĭ* (so called from a Saxon word, *elig*, an eel, or *helig*, a willow): cathedral town—rather than a city—on an eminence in that part of the fen-country of Cambridgeshire, England, called the *Isle of Ely*. The Eastern Counties and Great Northern railways have each stations, the former outside, the latter in the town. Pop. 7,700.

Ely Cathedral.—About 673, Etheldreda, daughter of the king of East Anglia, and wife of Oswy, King of Northumberland, founded a monastery here, and took on herself the government of it. 200 years afterward (870), the Danes ravaged the Isle, and destroyed the monastery, which was rebuilt 970 by St. Ethelwold, bp. of Winchester; and this continued till 1081, when a new church was begun, which was converted into a cathedral, and the abbey erected into a see 1109. The possessions of the abbey were divided between the bishop and the community. The cathedral contains some beautiful specimens of architecture, especially of Early Norman. Its exterior dimensions are 535 ft. from w. to e. The great cross or main transept is 190 ft. The turrets of the w. tower are 215 ft. high, and the lantern over the central tower 170 ft. The w. front was built by Geoffry Ridel, third bishop (d. 1189), and is of Norman work. About 200 years after his time, an addition of 64 ft. was made to the tower, and over that a spire. This great superincumbent weight crushed the n.w. transept, and the s.w. one, which still remains, was considerably weakened. In front there is a w. portico or galilee (q.v.), of Early Gothic, said to be the work of Bp. Eustachius. The nave is of Norman work, completed about 1174. The columns are alternately round and octagonal. The roof was, 1861, beautifully painted. The transepts, the most ancient parts of the church, were built in the reign of Henry I. They had originally a middle and two side aisles, but the latter are, in the s. transept, walled up, and the space used as a vestry and library. Originally there stood a square tower in the centre of the building, opening into the nave and transepts; but this gave way 1322, and fell eastward, crushing three arches of the choir. The repair of this dilapidation was undertaken by the sacrist of that time, Alan de Walsingham. The design was original, an octagon tower with four longer and four shorter sides, surmounted by a lantern. The upper part of this, of timber, has recently been rebuilt.

The choir contains some rich varieties of decorated Gothic, and the fine shafts of Purbeck marble combine beautifully with the white stone work. The whole has lately been restored and beautified. Originally, it was much shorter eastward, and protruded into the nave, but

in 1235 the semicircular end of the old church was taken down, and six arches added by Hugh de Northwold. At the dedication and removal of the relics, Henry III. and his court were present. The e. end is eminently beautiful: it consists of two tiers of high lancet-shaped windows. Perhaps the most interesting and beautiful part of the building is the Lady Chapel—an incomparable work, irreparably spoiled by the barbarism of Puritan times. It was begun 1321, and finished 1349, simultaneously with the rebuilding of the central tower and ruined choir, a fact highly illustrative of the taste and munificence of the times. It has a stone roof, like King's College Chapel in Cambridge, which it is supposed to have suggested, and the walls were once decorated from top to bottom with countless niches and images of saints and martyrs, not one of which remains undefaced. Its length is 100 ft.; width, 46; height, 60. Bp. Alcock's Chapel, in which he lies buried, is at the e. end of the n. aisle—an overloaded specimen of the richest florid Gothic. Bp. West's Chapel, at the e. end of the s. aisle, is a more pleasing example of the same style.

Among celebrated names connected with E. are Abbot Thurstan, who defended the Isle against William the Conqueror for seven years; Longchamp, chancellor and regent under Richard I.; Chancellor Morton, Simon Patrick, and Bp. Andrews. The bishops of Ely, like the bishops of Durham, formerly possessed a palatine jurisdiction, and appointed their own chief-justice, etc.; but this privilege was taken from them by the 6th and 7th Will. IV. The bishop of Ely is visitor to St. Peter's, St. John's, and Jesus Colleges, Cambridge, of which last he also appoints the master. There is a grammar-school attached to the Cathedral, founded by Henry VIII. There are some interesting remains of the old conventual buildings in the neighborhood of the Cathedral.

ELY, Richard Theodore, ph.d., ll.d.: political economist; b. Ripley, N. Y., 1854, April 13. He graduated at Columbia Coll. 1876, winning the graduate fellowship of letters, which enabled him to study for 3 years at Heidelberg Univ., Germany, where he received the degree ph.d., 1879. In 1885–92 he was assoc. prof. of political economy in Johns Hopkins Univ.; in the latter year took the chair of political economy in the Univ. of Wis. He was a frequent contributor to periodical literature from the beginning of his literary career, and on politico economical subjects has been recognized as an authority. He published *French and German Socialism in Modern Times* (1883); *The Past and Present of Political Economy* (1884); *The Labor Movement in America* (1886); *Co-operation in America* (1887); *Political Economy* (1889); *Social Aspects of Christianity* (1889); *Outlines of Economics* (1893); *Socialism and Social Reform* (1894); *The Social Law of Service; Monopolies and Trusts* (1900). He also edited Macmillan's *Citizen's Library of Economics, Politics and Sociology;* from 1885–92 was sec. of the Amer. Econom. Assn. and in 1899 elected pres.

ELYOT, *ĕl′ĭ-ŏt*, Sir Thomas, English author: b. Wiltshire not later than 1490; d. Carlton, Cambridgeshire, 1546, Mar. 20. In 1531–2, as ambassador to Charles V., he visited the Low Countries and Germany, having orders to procure, if possible, the arrest of Tyndale. *The Boke named the Gouernour, deuised by Sir Thomas Elyot, Knight*, was published in 1531. It may be described as the earliest treatise on moral philosophy in the English language, the author's principal object being 'to instruct men in such vertues as shall be expedient for them which shall have authoritie in a weale publike.' An elaborate 10th edition appeared in 1880, with life notes and glossary by H. H. S. Croft. This and 12 other of his works went through edition after edition in their author's lifetime, and have now become among the rarest treasures of the bibliomaniac.

ELYRIA, *ĕ′lĭr′ĭ′a:* town, cap. of Lorain co., O.; at junction of e. and n. branches of Black river; on the Lake Shore and Michigan Southern railroad at the junction of the Sandusky and Norwalk divisions; 7 m. s. of Lake Erie, 8 m. n.n.e. of Oberlin, 25 m. w.s.w. of Cleveland. The chief industries are the manufactures of cheese, grindstones, tobacco, confectionery, and screws, power for which is supplied by the river, which has a fall of 40 ft. here. Pop. (1900) 7,891.

ELYSIA, n. *ē-lĭz′ĭ-a* [L. *elysius*, pertaining to Elysium, the place of bliss]: a genus of mollusks, the type of *Elysiadeæ*, a family of nudibranchiate gasteropoda, shell-less and snail-like, with no distinct mantle or breathing organ, a single series of lingual teeth, and the sexes united. It contains 7 to 11 genera, as variously constituted.

ELYSIAN, a. *ĕ-lĭzh′ĭ-ăn* [L. *elysĭŭm;* Gr. *elusĭŏn*, the abode of the blessed]: pertaining to Elysium; delightful in the highest degree. Elysium, n. *ĕ-lĭzh′ĭ-ŭm*, in *anc. classical myth.*, a place in the infernal (in the sense of *lower*) regions, where the souls of the good dwell after death. In the *Odyssey*, Homer described it as a place where the souls of the departed lived in ease and abundance among innocent pleasures, and enjoying a mild and wholesome air. In the *Iliad*, however, he gives a sombre view of the state of the departed souls. Achilles, though in Elysium, is made to envy the life of the meanest hind on earth. By succeeding poets, the bliss of Elysium is drawn in much more lively colors. Besides the amenity and various delights of the place, diverse employments are found for the inhabitants, according to the ruling passion of each while on earth. Elysium was supposed by some writers to be in mid-air, by others in the sun, by others in the centre of the earth, next Tartarus, by others, in the Islands of the Blest. In modern figurative usage, it denotes any delightful place. Elysian Fields, in *anc. classical myth.*, the garden of Paradise, the abodes of happiness in the future life.

ELYTRON, n. *ĕl′ĭ-trŏn*, or El′ytrum, n. *-trŭm*, El′-

YTRA, n. plu. *-tră* [Gr. *ĕlŭtron*, a covering or sheath]: the hard coriaceous case or sheath which covers the wings of such insects as the beetle; the wing sheath. ELYT'RIFORM, a. *-fawrm* [L. *forma*, shape]: in the form of a wing-sheath. ELYTRINE, n. *ĕl'ĭ-trĭn*, the substance of the coriaceous wing-sheaths of beetles.

ELZEVIR, n. *ĕl'zĕ-vėr:* name given to works, chiefly ancient classics, printed and published mostly between 1583–1680, by the family *Elzevir* or *Elzevier*, at the Hague, Amsterdam, Leyden, and Utrecht; the name denotes also a kind of type first used by them. Of this celebrated family of printers, the first, LOUIS ELZEVIR, is said to have been born at Louvain about 1540. He was induced by religious disturbances to leave his native city, and, 1580, he settled as a bookbinder and bookseller in Leyden, where he died about 1617. The first work edited by him bears the title *Drusii Ebraicarum Quæstionum ac Responsionum Libri Duo, videlicet Secundus ac Tertius, in Academia Lugdunensi* MDLXXXIII. *Veneunt Lugduni Batavorum apud Elseuirium e Regione Scholæ Novæ.* The second, a Eutropius by P. Merula, bears date 1592, and was long erroneously believed to be the first from Elziver's press. Five of Louis's seven sons continued their father's business. Their names were Matthew, Louis, Aegidius, Jodocus (Joost), and Bonaventura. The last, in conjunction with his nephew Abraham E. (son of Matthew), prepared the smaller editions of the classics, in 12mo and 16mo, still valued for their beauty and correctness. It is mainly on these that their reputation is based. The house of Elzevir, in Amsterdam, was established 1638, by Louis, son of Jodocus Elzevir. Peter Elzevir, grandson of the last mentioned, carried on the bookselling business in Utrecht, and died 1696. For more than a century, however, this family has ceased to have any connection with book-printing. It is believed that 1,213 works in all proceeded from the Elzevir presses. Among the most beautiful are the editions of Pliny, Virgil, Livy, Tacitus, and Cæsar; and, though for Greek and Hebrew texts the house of Elzevir was surpassed by that of Stephens (q.v.), their Latin classics are unrivalled both for beauty and for correctness. It is said that the Elzevirs generally employed women to correct the press, under the conviction that they would be less likely than men, on their own responsibility, to introduce alterations into the text. Compare Adry, *Notice sur les Imprimeurs de la Famille des Elzevier* (1806); Pieter, *Annales de l'Imprimerie Elsévirienne* (1852); Willems, *Les Elzevier* (Brussels, 1880).

EM, *ĕm* [F. *en:* L. *in:* Gr. *en*]: a prefix; a form of *en*, which becomes *em* before *o*, *p*, or *m:* AS. prefix *em* signifies to make, to surround: Gr. prefix *em* signifies *in* or *on: em*, for L. *im*, signifies *in*, *on*, or *into*.

EMACIATE, v. *ĕ-mā'shĭ-āt* [mid. L. *emacĭātus*, made lean—from L. *e*, out of; *macĭārĕ*, to make lean or thin;

macĭēs, leanness]: to become lean; to deprive of flesh; to lose flesh gradually; to pine or waste away. EMA′CIATING, imp. EMA′CIATED, pp. EMA′CIA′TION, n. *-ā′shŭn*, a making lean; a becoming lean by a gradual waste of flesh; the state of being reduced to leanness: see CONSUMPTION: TABES DORSALIS.

EMAILOMBRANT, n. *ē-māl′ŏm-brant* [F. *email*, enamel, and *ombrer*, to shade]: process which consists in flooding transparent colored glass over designs stamped on earthenware or porcelain. A plane surface is thus produced, in which the cavities of the design appear as shadows.

EMANATE, v. *ĕm′ă-nāt* [L. *emānātus*, flowed out—from *e*, out of; *mānō*, I flow: It. *emanare;* F. *émaner*]: to issue or flow from something, as a source; to arise or spring from. EM′ANATING, imp. EM′ANATED, pp. EM′ANA′TION, n. *-nā′shŭn* [F.—L.]: that which issues or proceeds from any object as a source; a flowing from; an efflux. EM′ANATIVE, a. *-tĭv*, issuing from another. EM′ANA′TIVELY, ad. *-lĭ*. EM′ANA′TORY, a. *-nā′tėr-ĭ*, having the nature of an emanation.—SYN. of 'emanate': to spring; proceed; advance; flow; arise; issue.

EMANA′TION, in Theology and Philosophy: an ancient doctrine, which considered all things as emanating or flowing from a Supreme Principle, or the Original Being. According to this doctrine, the origin of things is only an overflowing of the divine fullness—an outstreaming of the light from the necessity of its nature, and not through any free action on the part of God. What is thus given off as a copy from original perfection, departs more and more from its source, and gradually degenerates, which was thought to account for the origin of evil. This doctrine came from the East, and pervades the Indian mythology, the system of Zoroaster, and the Neo-Platonic philosophy of Alexandria. In Christian theology, the idea of emanation has been applied to explain the relation among the persons of the Trinity.

EMANATION: see RADIUM and THORIUM.

EMANCIPATE, v. *ĕ-măn′sĭ-pāt* [L. *emancĭpātus*, declared free and independent—from *e*, out of, from; *mancipĭŭm*, the legal sale of a thing, a slave—from *mănus*, the hand; *căpĭō*, I take]: to set free from bondage or slavery; to restore to liberty; to free from any controlling influence; to manumit. EMAN′CIPATING, imp. EMAN′CIPATED, pp. set free from bondage or servitude; liberated. EMAN′CIPA′TION, n. *-pā′shŭn* [F.—L.]: deliverance from slavery (see SLAVERY); deliverance from bondage or controlling influence; the act of setting free from civil disabilities. EMAN′CIPA′TIONIST, n., or EMAN′CIPATOR, n. *-tėr*, an advocate for the abolition of slavery; one who liberates from bondage or slavery. EMAN′CIPIST, n. *-pĭst*, in *Australia*, a convict who has been set free, or who has regained his liberty.—SYN. of 'emancipation': deliverance; liberation; release: freedom.

EMANCIPATION.

EMANCIPA'TION, in the Roman Law: act by which the *Patria Potestas* (q.v.), or paternal authority, was dissolved in the lifetime of the father. It took place in the form of a sale (*mancipatio*) by the father of the son to a third party, who manumitted him. The Twelve Tables required that this ceremony should be gone through three times, and it was only after the third sale that the son become *suisjuris* under his own law. In general, the son was at last resold to the father, who manumitted him, and thus acquired the rights of a patron, which would otherwise have belonged to the alien purchaser who finally manumitted him. In the case of daughters and grandchildren, one sale was sufficient. If the child died intestate, or if he required a tutor or curator, the father's rights as patron came into play; but if the father died intestate, the son took nothing, because he was out of his family. But this rigor of the old law was modified by the prætor's edict, which placed all the children on the same footing. In the law of Scotland, emancipation is called Forisfamiliation (q.v.).

EMANCIPATION, in Latin-America: in Haiti, where African slavery was first introduced into America, the negroes received as a gift, 'the full liberty, equality, and fraternity' of the French republic in 1794, and by fighting established their independence in 1804. In Central America (when Guatemala, Salvador, Honduras, Nicaragua, and Costa Rica were united in the Central American republic), the laws of 1823, Dec. 31, and 1824, April 17 and 24 emancipated all slaves, and made free slaves of other countries coming to Central America. The slave trade was prohibited, under penalty of forfeiture of the rights of citizenship. Ecuador, which made its first effort to gain independence at Quito, 1809, Aug. 10, and actually threw off the yoke of Spain on 1820, Oct. 9, abolished slavery during the presidential term of Gen. Urvina, 1852–6. The Argentine nation began its struggle for independence 1810, May 25, and at the congress of Tucuman, 1816, July 19, the formal separation from Spain was declared. Article XV. of the Constitution of 25 Sep. 1860, provides that 'there shall be no slaves in the Argentine nation. Those few who now exist in it shall become free at the very moment this constitution goes into effect. The indemnifications which this declaration may involve shall be provided for by special law. Any contract involving the purchase or sale of a person shall be held to be a criminal offense. . . . Slaves introduced in any way whatever into the country shall become free by virtue of the fact that they have trodden the soil of the republic.' In Colombia (New Granada), the struggle for independence, beginning 1810, July 20 was continued after the union with Venezuela (Dec. 1819), and the republic of New Granada was formed in 1831. In 1821 a law was passed by the republic of Colombia for the gradual manumission of slaves, and all born after that date were declared free at the age of 18.

A law of 1851 abolished slavery entirely in New Granada, by giving liberty to all who remained slaves on 1852, Jan. 1, provision being made for the payment of indemnity to the owners. The beginning of the war for independence in Mexico dates from 1810, Sep. 16; on 1813, Nov. 6, the first Mexican congress, installed in the town of Chilpancingo, issued the declaration of independence and decreed the emancipation of slaves. Venezuela's declaration of independence 1811, July 5, was followed after 10 years by the law for the gradual manumission of slaves which we have mentioned above, that is, the law of the Greater Colombia of 1821. In Brazil the conservative statesman, Silva Paranhos, obtained from the parliament the passage of a bill 1871, Sep. 28, for the gradual extinction of slavery, which provided that thereafter every child born of a slave mother should be free, and created a special fund for emancipation by redemption. Private philanthropy, largely directed by the Masonic lodges, effected more than the fund created for this purpose; and the number of slaves began to decrease. A bill for the immediate and unconditional abolition of slavery in Brazil was signed by Princess Regent Isabel 1888, May 13; the monarchy was overthrown 1889, Nov. 15; the new Constitution approved 1891, Feb. 24. In Cuba the slaves were emancipated on the conclusion of the Ten Years' War, that is, in 1878, and Cuba became a republic 1902, May 20. The experiences of the French, Danish, and British possessions may be referred to briefly in conclusion. Napoleon restored slavery in French Guiana, Martinique, and Guadeloupe, although his efforts to accomplish the same result in Haiti were, as mentioned above, frustrated by the resistance of the blacks themselves. The freedom of all who were held in bondage throughout the French dominions was declared in 1848. Slavery in the Danish West Indies (St. Thomas, etc.) was abolished also in 1848. The act to abolish slavery throughout the British colonies, providing £20,000,000 for compensation of the owners, was dated 1833, Aug. 28, and its effect was to free 770,280 slaves on 1834, Aug. 1, the number thus emancipated in Jamaica being 309,000.

EMANCIPATION, Roman Catholic: see Roman Catholic Emancipation.

EMANCIPATION PROCLAMATION IN THE UNITED STATES: the Federal administration at the outbreak of the Civil War was awkwardly placed for dealing with slavery. To assail it in its own territory was not only to belie the past professions of the party, but to alienate so much Northern support as to assure failure; nor indeed had the great bulk of the Republican party any thought beyond fettering the slave power for future aggression. On the other hand, to leave slavery untouched was not only to chill the energies of the most reliable upholders of the War, but to give foreign countries a pretext for asserting that the North was fighting merely for dominion, and that the Southern cause was

that of liberty and morally entitled to help. The former horn of the dilemma was much the sharpest; and the government moved very cautiously, restraining its subordinates like Fremont 1861, Aug. 30, and Hunter 1862, May 9, from forcing its hand by emancipation orders. On 1861, Aug. 9, an act had declared masters employing slaves against the government barred from further claim to them; but that was a mere warning and rule of court. The first embarrassing problem was how to deal with slaves in conquered districts, or who had come within its lines: was the government to act as slaveholders' trustee and return them to servitude. The growing resentment against slavery as a convertible term for the rebellion, and disgust at being slave-catchers to the behoof of their enemies, supplied the answer, and on 1862, March 13, all army officers were forbidden to return fugitive slaves; their surrender from any quarter was made harder (though the fugitive-slave law was not formally abolished till 1864, June 28; on 1862, June 17, all captured, deserted, or fugitive slaves of owners in rebellion were freed. As to the main body, who plainly could not be left in unchanged status as the core of a fresh abscess, Lincoln's wish was for compensated emancipation; he sent a special message to congress March 6, and that body passed a joint resolution April 10, declaring that the United States ought to co-operate with any state which would adopt gradual abolition, by paying for the slaves, and on April 16 those in the District of Columbia were thus emancipated; but despite his repeated urgencies, the border states would take no measures of the kind. On June 19 the slaves in the Territories were freed.

The final blow came, as John Quincy Adams 20 years before had forecast that it would, by using the president's war power to suppress insurrection. As the second year of the conflict wore on, the majority demanded the crippling of its enemy by the most efficient means, and very many believed that a threat of general emancipation would bring about a general surrender. Lincoln wished for a great victory first, that it might not appear the selfish resource of an overmatched power; but the discouraging Peninsular campaign obliged him to satisfy his supporters by holding this bludgeon over the enemy.

However, the Union victory at Antietam gave him the desired opportunity, and on 1862, Sep. 22, he issued a proclamation announcing that 100 days after, on 1863, Jan. 1, the executive would issue another proclamation designating the states or parts of states then deemed in rebellion, evidence to the contrary being the presence of *bona fide* representatives in congress, that all slaves in the designated sections should be permanently free, and that the civil and military authorities of the United States would maintain their freedom, and would not repress any effort of theirs to make it good. The only result was a retaliatory proclamation by Jefferson Davis

Dec. 23, ordering that captured negro Federal soldiers and their officers should be turned over to the states, and that Gen. B. F. Butler should be hanged if captured. On the 1st of January the threatened proclamation was issued, as 'by virtue of the power in me vested as commander-in-chief of the army and navy of the United States, and as a fit and necessary war measure for repressing said rebellion.'

Politically, the results were enormous. Recognition of the Confederacy thenceforward meaning a flat maintenance of slavery instead of freedom, the entire anti-slavery sentiment of France and Great Britain was thrown against those countries' interference, which at once became unthinkable. It drove away many lukewarm northern adherents, and brought many local and State defeats to the administration; but it took the union party 'off the fence,' and made it a coherent organization with one firm, open principle, for many years unassailable. In the South, as defeat meant emancipation by their enemies and it would be no worse if done by themselves, some of the leaders (as Lee) seriously thought of offering freedom to slaves to fight in their armies in the latter part of the War, hoping to save independence at least to the South.

EMANUEL I., *ĕm-ăn′ū-ĕl*, King of Portugal, styled THE GREAT, sometimes THE FORTUNATE: 1469, May 3—1521, Dec. 13 (reigned 1495–1521). Before his accession to the throne at the death of John III., he bore the title of Duke of Beja. On his accession, he prepared the code of laws which bears his name, and rendered himself remarkable by his zealous activity in the cause of education, by his active piety, and by his predilection for the society of artists and scholars. Through his exertions, Portugal became the first naval power of Europe, and the centre of the commerce of the world. He dispatched Vasco da Gama to round the Cape of Good Hope, and discover the passage to India. Cabral was commissioned by him to prosecute further the discoveries of Vasco da Gama, and Corte Real to sail along the coasts of N. America. The expeditions under Albuquerque put E. in possession of the s. coast of Africa and of the Indian Archipelago. Not satisfied with this, he opened a communication with Persia, Ethiopia, and, 1517, with China. At his death Portugal was in possession of a large fleet, strong fortresses, well-furnished arsenals, a warlike army, a flourishing trade and commerce, and extensive colonies. His reign has been termed the golden age of Portugal. E. was thrice married: first to Isabella, daughter of Ferdinand; afterward to Mary of Castile, her sister (by whom he had two children, John and Isabella, the former of whom succeeded him on the throne); and thirdly, to Eleanore of Austria, sister of Charles V.

EMARGINATE, a. *ē-mâr′jĭ-nāt*, or EMAR′GINATED [L. *emarginātus*, deprived of its edge—from *e*, out of; *margo*, the extremity or margin]: having the margin broken by

an obtuse notch or the segment of a circle; in *bot.*, slightly notched at the summit, as if a piece had been cut out: see LEAVES.

EMARGINULA, n. *ĕ-mâr-jĭn′ū-la* [dim. of L. *emarginatus*, notched]: genus of mollusks having shells with a notch upon the anterior margin. Forty recent species are known, and 40 fossil. The former extend in space from Britain to Australia, the latter in time from the Trias till now.

EMASCULATE, v. *ĕ-măs′kū-lāt* [mid. L. *emasculātus*, castrated—from L. *e*, out of; *mascŭlŭs*, a male: to geld or castrate; to weaken; to render effeminate. EMAS′CULATING, imp. EMAS′CULATED, pp. EMAS′CULA′TION, n. *-lā′shŭn* [F.—L.]: the act of depriving of virility; unmanly weakness.

EMBA, *ĕm′bâ:* river of Turkistan, Kirghiz territory. It rises at the w. base of the Muehajar or Mongojar Mountains, and flowing s.w. enters the Caspian Sea after a course of about 300 miles.

EMBALE, v. *ĕm bāl′* [*em*, to make, and *bale:* F. *emballer*, to pack up]: in *OE.*, to make up into a bundle; to inclose. EMBAL′ING, imp. EMBALED′, pp. *-bāld′*.

EMBALM, v. *ĕm-bâm* [F. *embaumer*, to embalm or perfume—from *em*, in; *baume*, balsam—from L. *balsămum*]: to fill the internal parts of a dead body with aromatics and drugs in order to preserve it from decay; to preserve and treasure with great care; to preserve with affection, as, to embalm in one's memory. EMBALM′ING, imp.: N. a process by which a dead body is preserved from putrefaction and decay. EMBALMED′, pp. *-bâmd′*. EMBALM′ER, n. *-ėr*, one who.—The art of embalming was invented by the Egyptians, whose prepared bodies are known by the name of mummies, and are called in the hieroglyphs *sahu*, and by St. Augustine *gabbaroe*. This art seems to have derived its origin from the notion, that the preservation of the body was necessary for the return of the soul to the human form after it had completed its cycle of existence of three or ten thousand years. Physical and sanitary reasons also may have induced the ancient Egyptians; and the legend of Osiris, whose body, destroyed by Typhon, was found by Isis, and embalmed by his son Anubis, gave a religious sanction to the rite, all deceased persons being supposed to be embalmed after the model of Osiris in the *abuton* of Philæ. The art appears as old as B.C. 4,000 at least, the bodies of Cheops, Mycerinus, and others of the age of the 4th dynasty having been embalmed. One of the earliest recorded embalmments on record is that of the patriarch Jacob; and the body of Joseph was thus prepared, and transported out of Egypt. The process has been described by Herodotus and Diodorus; but their accounts can refer only to their own age, and are only partially confirmed by an examination of the mummies. The following seems to have been the usual rule observed after death. The

relations of the deceased went through the city chanting a wail for the dead. The corpse of a male was at once committed into the charge of the embalmers; if a female, it was retained at home till decomposition had begun. The *paraschistes*, or flank-inciser of the district, a person of low class, whose establishment was in the cemeteries or suburbs, conveyed the corpse home. A scribe marked with a reed-pen a line on the left side beneath the ribs, down which line the paraschistes made a deep incision with a rude knife or Ethiopian stone, probably flint. He was then pelted by those around with stones, and pursued with curses. Another kind of embalmer, the *tarichcutes*, or preparer, then proceeded to remove the entrails and lungs, with the exception of the heart and kidneys. The brain was extracted by another tarichcutes, by a crooked instrument, through the nose. All this having been effected, the body was ready for the salts and spices necessary for its preservation, and the future operations depended upon the sum to be expended on the task. When Herodotus visited Egypt, three methods prevailed: the first, accessible only to the wealthy, consisted in passing peculiar drugs through the nostrils into the cavities of the skull, rinsing the belly in palm-wine, and filling it with resins, cassia, and other substances, and stitching up the incision in the left flank. The mummy was then steeped in natron for 70 days, and wrapped up in linen, cemented by gums, and set upright in a wooden coffin against the walls of the house or tomb. This process cost a silver talent, which considering the relative value of ancient money at one-third of that at present, would amount to somewhat more than $3,500. The second process consisted in removing the brain, as before, but only injecting the viscera, with *kedrion*, or cedar oil, and soaking the corpse in a solution of natron for 70 days, which brought away or destroyed the viscera and soft portions, leaving only the skin and bones. The expense was a *mina*, relatively worth about $1,180. The third process, in use for the poorer classes, washed the corpse in myrrh, and salted it for 70 days. The expense was small, not mentioned. When thus prepared, the bodies were ready for sepulture, but were often kept before burial some time—often at home—and even produced at festive entertainments, to recall to the guests the transient lot of humanity. When buried they were sent to the *cholchytæ*, a higher class than the *tarichcutæ*, who had charge of the tombs, the mummies, and the masses for the dead. All classes were embalmed, even malefactors; and those who were drowned in the Nile or killed by crocodiles received an embalmment from the city nearest to which the accident occurred. As the art, however, was practiced for many centuries, it may be easily conceived that mummies were preserved by very different means, and quite distinct from those described by classical authors, some having been found merely dried in the sand; others salted by natron, or boiled in

resins and bitumen, with or without the flank incision, having the brains removed through the eyes or base of the cranium, with the viscera returned into the body, placed upon it, or deposited in jars in shapes of the genii of the dead, the skin partially gilded, the flank incision covered with a tin plate, the fingers cased in silver, the eyes removed, and replaced. The mummies are generally wrapped in linen bandages, and placed in costly coffins: see SARCOPHAGUS. The sacred animals were also mummied, but by simpler processes than men. The ancient mummies were used in the 15th and 16th c. of the Christian era for drugs and other medical purposes, and for nostrums against diseases; and a peculiar brown color, used as the background of pictures, was obtained from the bitumen. The Ethiopians used similar means to preserve the dead, and the success of embalming may be judged from the numerous mummies in the different museums of Europe. Other less successful means were used by nations of antiquity to embalm. The Persians employed wax; the Assyrians, honey; the Jews embalmed their monarchs with spices, with which the body of our Lord was also anointed; Alexander the Great was preserved in wax and honey, and some Roman bodies have been found thus embalmed. The Guanches, or ancient inhabitants of the Canary Isles, used an elaborate process like the Egyptian; and desiccated bodies, preserved by atmospheric or other circumstances for centuries, have been found in France, Sicily, England, and America, especially in Central America and Peru. The art of embalming was probably never lost in Europe; and De Bils, Ruysch, Swammerdam, and Clauderus boast of great success in the art. There was a celebrated cabinet of M. De Rasière 1727, containing prepared bodies; and the mode of embalming princes and others, by prepared balms and other substances, is detailed by Penicher, consisting in the removal and separate embalmment of the heart and viscera, and removing the brain, and introducing the preparations by incisions all over the body. Dr. Hunter injected essential oils through the principal arteries into the body. Boudet, during the French Empire, embalmed the bodies of the senators with camphor, balsam of Peru, Jews' pitch, tan and salt; but the discovery of Chaussier of the preservative power of corrosive sublimate, by which animal matter becomes rigid, hard, and grayish, introduced a new means of embalming by Beclard and Larrey; but owing to desiccation, the features do not retain their shape. The discovery of the preservative power of a mixture of equal parts of acetate and chloride of alumina, or of sulphate of alumina, by Gannal, 1834, and of that of arsenic by Tranchini, and of pyroxilic spirits by Babington and Rees, 1839, and of the antiseptic nature of chloride of zinc, have led to the application of these salts to the embalming or preparation of bodies required to be preserved for a limited time; but there is no reason to believe that bodies so preserved

will last so long as Egyptian mummies. See Pettigrew, *History of Mummies* (4to, Lond. 1834); Gannal, *Traité d'Embaumement* (8vo, Paris 1838), translated by Harlan (8vo, Philadelph. 1840); Magnus, *Das Einbalsamiren der Leichen* (8vo, Braunsch, 1839).

EMBANK, v. *ĕm-băngk'* [*em*, in, and *bank*]: to inclose or protect by a raised mass of stones or earth; to defend or protect by a mound or dike. EMBANK'ING, imp. EMBANKED, pp. *-băngkt'*. EMBANK'MENT, n. an inclosure by a mound of earth or stone. Embankments, in *engineering*, are masses of earth, rock, or other materials artificially formed, and rising above the natural surface of the ground. They are formed chiefly (1) to bear railways, common roads, canals, etc., over depressions of the country; or (2) for hydraulic purposes, such as the formation of reservoirs; or as defenses against the overflowing of rivers, the encroachments of the sea, of lakes, etc.

In the formation of canals, railways, and other roads, embankment and *excavation* go hand in hand, and, under the name of EARTHWORK, form a vast branch of industry.

In planning such works engineers follow, as much as possible, the principle of making the cuttings or excavations and the embankments balance; i.e., of making the earth, etc., taken from the cuttings suffice for the formation of the embankments: see RAILWAYS (*Construction*). In proceeding to the actual construction of a railway embankment, e.g., a beginning is made at the points where the level of the formation meets the surface of the ground and on each side of these points the cutting is taken out, and the embankment formed by men using pick, shovel, and barrow, so that a roadway is formed for a distance of 50 to 100 yards. When the 'lead,' or the distance between the face of the cutting and the 'tip-ahead,' or end of the embankment, is greater than this, it is no longer economical to use the barrow. To continue the cutting and embankment, several methods may be employed; the most common are, dobbin carts; small wagons run upon light rails at a narrow gauge, and drawn by men or horses; ordinary earth-wagons drawn by horses, and occasionally by a locomotive; and lastly, ballast-wagons or trucks drawn by a locomotive. The cost of earthwork naturally varies greatly with the nature of strata in which the cutting has to be made, the length of the 'lead,' and other circumstances. When rocks have to be cut through, blasting (q.v.) is resorted to. One of the points on which considerable doubt existed, was as to the inclination of the side-slopes of embankments; but it has been found that nearly all kinds of earthworks will stand at an inclination of $1\frac{1}{2}$ horizontal to 1 vertical. When, however, it is necessary to use very wet substances, such as peat-moss or wet clays, or when the embankment is of great height, a flatter slope may be necessary. In many cases, it is advisable to substitute a viaduct (q.v.) for an embankment. All embankments put in as above mentioned subside more or less, the subsidence being much more

distinctly perceptible in clay than in gravel. When clay is thrown by the wagon over a considerable tip, the lower half of the embankment will be seen to consist of round bullets of clay of sufficient hardness to resist being squeezed into one mass by the weight of the embankment, until, in the course of time, from the effects of moisture, they become gradually disintegrated, and a settlement or sinking of the embankment takes place, sometimes to the extent of a twelfth, or even a tenth of the height. The greatest sinking usually occurs during the first wet weather after the formation of the embankment; but it sometimes goes on, though more and more slowly, for years. In the case of railway embankments, this subsidence is seldom of very great importance. If the permanent rails are laid, the labor and expense of restoring them to the level is not great, and the embankment should always be formed sufficiently wide at the top to allow of filling it up to its proper level without adding to the slopes. It is, however, practicable, though rather hazardous, to widen it at the top afterward by cutting trenches in the slopes.

When the side-slope of the ground on which an embankment is to be formed is very steep, the whole work has a tendency to slip laterally; and to prevent this, trenches or steps are cut in the ground before putting in the embankment. When the material is very wet, it sometimes is impossible to prevent the slopes from bulging out, in which case it is generally sufficient to put in additional stuff until the work stands. Peat-moss is seldom used to form an embankment, but frequently an embankment has to be formed where the ground below is moss to a considerable extent. In this case, many plans have been adopted to form a substantial unyielding work, which, where the moss is deep, and contains much water, is often very troublesome and expensive. Among these, perhaps, in most cases, the best is to continue throwing in earth until no further subsidence takes place. In some cases, piling has been adopted, and in others, a layer of tree-tops and brushwood has been placed on the moss as basis for the embankment. When this is done, it frequently happens that the ground on each side of the embankment opens in great rents, rises to a considerable height, and moves laterally from the embankment.

Embankments when finished, have their side-slopes usually covered with soil and sown with grass-seeds, this not only improves their appearance, but adds considerably to their stability, preventing rain and wind from doing the damage that might otherwise take place.

In regard to embankments to restrain or prevent the encroachment of water, it is necessary, in addition to forming them of sufficient height and strength, to cover the surface of the slopes in such a way that the action of the water will not affect it. Of course the method adopted must depend entirely on the nature of the case; where,

for example, the water only occasionally touches the embankment, as in the case of river-floods, and does not run with great violence along it, good turf pinned to the slopes has been found effectual. Where, however, the slopes are subject to the action of waves or rapid water, more effectual and expensive measures must be adopted, such as stone-pitching, piling, etc. Embankments of this nature are used on a great scale in Holland. see DIKE.

Embankments for damming up water to form ponds or reservoirs, require, in addition to the other conditions to be perfectly water-tight; and for this purpose a 'puddle-wall' of clay is carried from top to bottom in the heart of the structure. The great difficulty lies in preventing the water from finding its way between the bottom of the puddle-wall and the foundation on which it rests, or even through the substances of which that foundation consists; and the wall must often be carried to a great depth below the surface of the ground until an impermeable stratum be found. A knowledge of the geology of the place is here essential to the engineer.

EMBAR, v. *ĕm-bâr'* [*em*, to make, and *bar*]: in *OE.*, to inclose; to block up; to hinder.

EMBARGO, n. *ĕm-bâr'gō* [Sp. *embargar*, to impede, to restrain; *embargo*, impediment, an embargo]: order by authority to a ship or ships not to leave a harbor or port; an order to a ship not to trade for a limited time. It may apply to vessels and goods, or to specified goods only; it may be general or special; it may apply to the entering only, to the departure only, or to both entering and departure of ships from particular ports. Embargoes are usually connected in some way with a state of war. V. to order a ship not to leave harbor. EMBAR'GOING, imp. EMBAR'GOED, pp. *-gōd*, hindered from sailing or trading for a time.

EMBARGO IN THE UNITED STATES: American embargoes belong exclusively to the French-English wars of 1794–1814. The first embargo was for 60 days, due to mutual orders of France and England for seizure of neutrals which placed the United States between hammer and anvil. Jay's Treaty of 1794, Nov. 19, for 12 years measurably protected our commerce, but near its end conditions became infinitely worse. In 1806–7 the thronging mutual blows of England and Napoleon, ending in the former's Orders in Council of Nov. 11, and the latter's Milan Decree of 1807, Dec. 7, made practically every neutral vessel good prize to one or the other. Even more intolerable were the rights of search and impressment claimed by Great Britain, which swept several hundred American sailors every year into the British fleets, and in one massacre outraged and humiliated this country beyond forgiveness. But aside from the reasons above given, few landsmen believed till the victory of the 'Constitution,' that American ships could fight English on equal terms, and it was the general conviction that in case of war our entire fleet would at once be 'Copenhagenized' (that is,

captured bodily and added to the British fleet, as was the Danish). At Jefferson's recommendation, therefore, 'The Embargo' was passed 1807, Dec. 22, forbidding all foreign commerce till the obnoxious decrees were repealed. The havoc not only in trade but in the interior life of the people was terrific; the exports fell from $110,084,207 in 1807 to $22,430,960 in 1808. New England, the commercial region of the country, fought the embargo with the fierceness of a struggle for life; evaded it largely by sea, and sent armies of smugglers overland to Canada. Congress then extended the act to rivers, lakes, and bays, and allowed collectors to seize on suspicion; and the next congress, 1809, Jan. 9, passed a drastic enforcing act, imposing enormous fines, forfeitures, and bonds, and making the collectors supreme despots of their districts. New England was nearly in insurrection; the collectors were in danger of the fate of those under the Stamp Act, some resigned, others were sued in the state courts; the judges would give no findings against smugglers; finally the states threatened nullification, and John Quincy Adams (a victim to its support) declared that they had resolved to withdraw from the Union, at least temporarily, if force were used, and had opened negotiations with Great Britain. A Federalist declared in the senate that blood would flow. The Democrats were frightened, and hastily fixed (1809, Feb. 3) March 4 for its discontinuance. But the next month they had regained courage, and passed a 'non-intercourse act' to take its place; still prohibiting intercourse with France of Great Britain, but restoring it with other countries and allowing free coasting trade. This policy was continued till the War of 1812 opened. The hostility of New England to the war, only less destructive than the embargo and against her political feelings, induced the British government ostentatiously to relieve that section from the blockade, to sow discord and make a base of naval supplies; and on 1813, Dec. 17, a new embargo was laid to 1815, Jan. 1, which, however, was repealed 1814, April 14. Jefferson always asserted that the policy was the best, and the embargo would have accomplished its object if New England would only have helped. (See histories of the United States through this period, as Schouler, McMaster, etc.; especially Henry Adams' *History*, covering 1801–15.)

EMBARK, v. *ĕm bârk'* [F. *embarquer*, to put on shipboard—from *em*, in or on; *barque*, a boat, which see]: to go on board a ship about to sail; to cause to go on board a ship; to engage in any undertaking; to engage another in any affairs. EMBARK'ING, imp. EMBARKED', pp. *-bârkt'*. EMBARKATION, n. *ĕm'bâr-kā'shŭn*, the act of going or of putting on board a ship for a voyage or journey by sea; that which is embarked—sometimes spelled EMBARCATION [F.—L.].

EMBARRASS, v. *ĕm-băr'răs* [F. *embarrasser*, to entangle, to perplex: Sp. *embarazo*, obstruction, perplexity;

Port. *embaraçar*, to mix, to embro..—from the root *bar*, used to represent confused sound]: to confuse; to perplex; to entangle; to involve; to abash. EMBAR′RASSING, imp. ADJ. perplexing; confusing. EMBAR′RASSED, pp. *-băr′răst*, perplexed; confused. EMBAR′RASSMENT, n. *-mĕnt*, perplexity; confusion; distress or perplexity from inability to discharge debts.—SYN. of 'embarrass': to clog: hinder; encumber; impede; obstruct; fetter; retard; prevent; shackle; perplex; entangle; confuse; disconcert; puzzle; distress; abash.

EMBASE, v. *ĕm-bās′* [*em*, to make, and *base*]: in *OE.*, to debase; to degrade; to lower. EMBAS′ING, imp. EMBASED′, pp. *-bāst′*.

EMBASSY, n. *ĕm′băs-sĭ*, or EM′BASSAGE, n. *-sāj* [mid L. *ambascĭă*, business of another, message committed to another: F. *ambassade;* OF. *embassade*, an embassy, a love message (see AMBASSADOR)]: a public message to another nation; the charge of a public minister to a foreign court; the minister himself, his residence and suite; a solemn message. In a popular sense, all diplomatic missions are spoken of as embassies; but this is not the technical meaning of the term. In its more limited acceptation, embassy is a mission presided over by an ambassador, as distinguished from a mission or legation intrusted to an envoy, or other inferior diplomatic minister. The only difference between the powers and privileges of the ambassador and the envoy is, that the former represents the person of his sovereign, or of the supreme official of his govt., and in this capacity he can demand a private audience of the sovereign to whom he is accredited; while the latter must address himself to the minister for foreign affairs: see AMBASSADOR: ENVOY: CONSUL: MINISTER, in Diplomacy.

EMBATTLE, v. *ĕm-băt′l* [*em*, in or on, and *battle:* comp. a supposed OF. *embastiller;* mid. L. *imbattălārĕ*, to fortify]: to array troops for battle; to indent for ornament or defense, as a wall. EMBAT′TLING, imp. *-băt′lĭng*. EMBAT′TLED, *-băt′ld:* ADJ. furnished with battlements; in *her.*, embattled or imbattled (called also Crenellé), is one of the partition lines, traced in the form of the battlements of a castle or tower. A bordure embattled is often given as a difference to any member of a family who is, or has been, a soldier. EMBAT′TLEMENT, n. *-băt′l-mĕnt*, an indented parapet-wall: see BATTLEMENT.

EMBAY, v. *ĕm-bā′* [*em*, in, and *bay*]: to inclose, as a ship in a bay, or between points of land. EMBAY′ING, imp. EMBAYED′, pp. *-bād′*.

EMBED, v. *ĕm-bĕd′* [*em*, in, and *bed*]: to lay deeply in surrounding matter, as in clay, sand, or mortar. EMBED′DING, imp. EMBED′DED, pp. sunk in and surrounded by another substance. EMBED′MENT, n. *-mĕnt:* also spelled IMBED.

EMBELIA, n. *ĕm-bĕl′ĭ-a* [Ceylonese name of one of the species] genus of plants, type of the tribe *Embelieæ*, a tribe of *Myrsinaceæ*. About 20 species are known.

EMBELLISH, v. *ĕm-bĕl'lĭsh* [F. *embellir*, to adorn: *embellissant*, adorning, beautifying—from *em*, in or on, and *belle*, beautiful: OF. *bel*, fair—from L. *bellus*, pretty] to decorate; to beautify; to adorn. EMBEL'LISHING, imp. EMBEL'LISHED, pp. *-lĭsht:* ADJ. decorated; beautified. EMBEL'LISHMENT, n. the act of adorning; anything that adds beauty or elegance; ornament; decoration. EMBEL'LISHER, n. *-er*, one who.—SYN, of 'embellish'; to deck; enrich; illustrate; grace; ornament.

EMBER-DAYS, n. *ĕm'bėr-* [Ger. *quatember*, a corruption of the L. *quatŭŏr tempŏrā*, the four seasons: Low Ger. *tamper;* Sw. *ymber-dagar*, ember- or imber-days]: certain days set apart by the church for fasting at the four seasons of the year—viz., every quarter; in the church calendar, certain fast-days for imploring a blessing on the ordinations performed at those times. According to the *Book of Common Prayer* of the Church of England, three days are appointed four times in the year to be observed as days of fasting and abstinence; these days are the Wednesday, Friday, and Saturday after the Sunday first in Lent, after the feast of Pentecost or Whitsunday, after Sep. 14, and after Dec. 13. The term 'embering' has been variously derived from the Greek *hēmera*, day, and from the embers or ashes which in the earliest times were strewed over the head at seasons of fasting, in token of humility and self-condemnation. But the more correct derivation would appear to be from the Saxon *Ymbrine dagas*, from the Saxon *ymb*, about, and *ryne*, a course or running, the term applied to these fasts because they came round at certain set seasons in the year.—Somner, *Dictionarium Saxonicum*. This phase is used in the laws of Alfred the Great, also of Canute, and corresponds with the term used by the canonists, *jejunia quatuor temporum*, the fasts of the four seasons. Somner says that the embering days were 'times of old chosen and set apart for fasting and prayer for obteyning the fruits of the earth, and to give thanks for the same, whereas at those times they are either sowen, sprung up, coming in their ripenesse, or gathered into the barne, as also to obtaine the grace of the Holy Ghost, when holy orders are given and ministers made.' It is to this latter purpose that the Church of England in the present day particularly devotes the ember days, and a special prayer is appointed for use at those seasons.

EMBERI'ZA and EMBERIZI'DÆ: see BUNTING.

EMBERS, n. plu. *ĕm'bėrz* [AS. *æmyrie* or *æmyrian;* Dan. *emmer;* Sw. *morja*, hot or glowing ashes]: cinders still hot; the expiring residuum of a fire.

EMBEZZLE, v. *ĕm-bĕz'l* [*em*, to make, and *OE. bezzle*, to guzzle, to drink hard: OF. *besiller*, to overturn, to destroy: com. Gael. *an-beusail*, dishonest, immoral—*lit.*, to waste or destroy]: to misappropriate the money of an employer; to apply to one's own use money held in trust. EMBEZ'ZLING, imp. *-bĕz'lĭng*, making away by a servant with property intrusted to him by his master. EMBEZ'-

ZLED, pp. *-bĕz′ld.* EMBEZ′ZLEMENT, n. *-bĕz′l-mĕnt,* felonious appropriation by clerks, servants, or others in a position of trust, of goods, money, or other chattels intrusted to their care, or received in the course of their duty, on account of their employers. EMBEZ′ZLER, n. *-bĕz′lėr,* one who.—*Embezzlement* not being a crime under the English common law, was made such by statute at an early day. It is intended to embrace the stealing of property by servants, agents, public officers and others intrusted therewith, and is a species of a larger offense known in the law as larceny (q.v.). The earliest English statute was that of 21 Hen. VIII. c. 7, enacted 1529, and provided in substance that servants having effects delivered to them by their masters or mistresses to keep, and going away with or embezzling them to the value of 40 shillings, should be guilty of felony. An exception was created in favor of apprentices and persons under 18 years of age. Subsequent English statutes are: 39 Geo. III. c. 85 (1799), 7 and 8 Geo. IV. c. 29 § 47 (1827), and the act now in force in England, 24 and 25 Vict. c. 96. See BANKRUPT.

In American law this offense varies according to the statutes in the different states, but it may be comprehensively defined as the fraudulent appropriation of property by a person to whom it has been intrusted. The necessary elements constituting it are: the property must taken by the offender in the ordinary course of his employment, and must, unless the statutes prescribe otherwise, have come into his hands by virtue of such employment. The property must come from a third party into the offender's possession, before it reaches the master. Embezzlement has been made a felony in the majority of the American states. The crime in its various forms is punishable also under federal law.

EMBITTER: see IMBITTER.

EMBLAZE, v. *ĕm-blāz′* [see EMBLAZON]: in *OE.,* to emblazon; to adorn with gaudy or glittering ornaments. EMBLAZ′ING, imp. EMBLAZED′, pp. *-blāzd′.*

EMBLAZON, v. *ĕm-blā′zn* [*em,* on; F. *blasonner,* to blazon a coat of arms (see BLAZON 1)]: to adorn with figures of heraldry; to adorn with glaring colors; to display pompously. EMBLA′ZONING, imp. adorned with armorial figures: N. the act of adorning with armorial figures or ensigns. EMBLA′ZONED, pp. *-blā′znd,* adorned with armorial figures or ensigns. EMBLA′ZONMENT, n. *-zn-mĕnt,* the act of emblazoning. EMBLA′ZONRY, n. *-zn-rĭ,* pictures on shields; display of figures.

EMBLEM, n. *ĕm′blĕm* [F. *emblème*—from L. and Gr. *emblēmă,* inlaid work—from Gr. *emballo,* I cast in or insert —*lit.,* that which is inserted into the substance of another body]: an object which while representing one thing to the eye represents another to the understanding; a figure; a type; a symbolical representation. The meaning of the emblem rests upon its secondary, not its primary significa-

tion. Emblem is used often in a sense synonymous with the wider word symbol (q.v.). Em'blemat'ic, a. *-blĕ-măt'ĭk*, or Em'blemat'ical, a. *-ĭ-kăl*, consisting of or containing an emblem; figurative; allusive. Em'blemat'ically, ad. *-lĭ*. Emblemize, v. *ĕm'blĕm-īz*, to represent by emblems. Em'blemi'zing, imp. Em'blemized, pp. *-īzd*.—Syn. of 'emblem': symbol; sign; signal; device.

EMBLEMATA, *ĕm-blē'ma-ta* [Gr]: the works of art with which gold and silver vessels were decorated by the ancients. These sculptured figures were usually executed either in the precious metals or in amber. They were called *crustæ* by the Romans, though the Greek word also was used.

EMBLEMENTS, n. plu. *ĕm'blĕ-mĕnts* [F. *emblaver;* OF. *embléer*, to sow a field with corn: F. *blé* or *bled*, corn]: in *law*, growing crops of cereal and vegetable productions raised by the labor of the cultivator and to which the outgoing tenant has claim.

The doctrine of emblements applies to tenants for life (see Life-Rent), and other tenants of estates of *uncertain* duration, excepts tenants at sufferance. It is derived from the feudal law whereby, when a tenant for life died between March and August, his heirs were entitled to the profits for the whole year. The purpose is to enable the tenant after the expiration of his tenancy to gather the reward of his industry expended upon the soil. It is only annual crops, or such as require annual planting or renewal, as distinguished from permanent grasses, trees, and roots, which are the subjects of emblements. If the estate of the tenant is of uncertain duration, no right to emblements is created, even in growing crops; the reason being, that as the tenant knows when his estate must come to an end, it is an act of folly on his part to plant crops which he will be unable to gather. The tenancy in order to give a right to emblements must be ended by no act of the tenant. To obtain the emblements the tenant in whose favor the right exists may go upon the land and perform the necessary duties in respect to the crops, and gather the same. The law of emblements is governed very materially by local customs and usages which vary in different agricultural localities.

EMBLICA, *ĕm'blĭ-ka:* a genus of plants of the nat. ord. *Euphorbiaceæ*, having a fleshy fruit. *E. officinalis* is a tree found in most parts of India, with a crooked stem, thinly scattered spreading branches, long narrow leaves, minute greenish flowers, and a globular fruit about the size of a gall-nut. The fruit is very acid, and somewhat astringent, which qualities it retains when dry and shriveled. It is used in India as a deobstruent and febrifuge, also for tanning leather, and making ink, and is generally called *Emblic Myrobalans.*

EMBODY, v. *ĕm-bŏd'ĭ* [*em*, in or on, and *body*]: to collect into one mass or whole; to incorporate. Embod'ying, imp. Embod'ied, pp. *-ĭd*, invested with body; massed

into orderly arrangement out of a number of individuals, as troops. EMBOD'IMENT, n. *-ĭ-mĕnt*, the act of uniting into a whole out of a number of individuals or units: that which is so united; a former spelling, IMBODY.

EMBOLDEN, v. *ĕm-bōld'ĕn* [*em*, to make, and *bold*]: to give boldness or courage to. EMBOLD'ENING, imp. EMBOLD'ENED, pp. *-ĕnd*, encouraged.

EMBOLISM, n. *ĕm'bō-lĭzm* [OF. *embolisme*, an addition, as of a day into a year—from Gr. *embŏlē*, an insertion; *embŏlisma*, anything put in, a patch—from *em*, in; *ballō*, I cast]: in *med.*, the process by which a thrombus or clot undergoes disintegration into minute particles which are arrested in the capillary circulation; the insertion of days, months, or years, into an account of time to produce regularity. EMBOL'IC, a. *-bŏl'ĭk*, and EM'BOLIS'MIC, a. *-lĭs'-mĭk*, pertaining to. EMBOLISMIC YEAR, applied to the year in which additional months are required to fill up the lunar cycle.

EM'BOLISM in Medical Science: plugging up of a blood-vessel by a clot, such as a detached shred of a morbid growth from a diseased cardiac valve, etc. It is chiefly in cases of ill-nourished, brokendown constitutions, or after protracted or debilitating illness, that the morbid tendency of the fibrin to coagulate spontaneously within the veins exists, and in such cases very trival circumstances may call it forth, especially if they lead to any pressure on the vessel. Clots, or portions of a clot, may be transported by the blood-current from the venous system to the right side of the heart, and block up the pulmonary artery either entirely or in part: if the occlusion is entire, sudden death is produced; while, if it is only partial, gangrene, or inflammation of a part of the lung, commonly ensues. Many of the sudden deaths of women in childbed (till recently inexplicable) are due to this cause, the plug being formed in the inflamed uterine veins, or possibly, in some cases, in the right side of the heart, and passing thence to the spot where its arrest proves suddenly fatal. Similar accidents may befall the arterial system.

EMBONPOINT, n. *âng'bŏng-pwŏng'* [F.—from *en bon point*, in good condition]: stoutness of person; a full fleshy figure.

EMBORDER, v. *ĕm-bŏr'dėr* [*em*, on, and *border*—which see]: to adorn with a border.

EMBOSOM, v. *ĕm-bûz'ŭm* [*em*, in, and *bosom*]: to hold in the bosom; to caress; to inclose in the midst, usually said of trees; to surround. EMBOS'OMING, imp. EMBOS'OMED, pp. *-ŭmd:* also spelled IM-.

EMBOSS, v. *ĕm-bŏs'* [Sp. *embozar*, to muffle the face, to cast out of the mouth: F. *bouche*, a mouth]: in *OE.*, to press a wild animal so much in the chase as to cause it to foam freely. EMBOS'SING, imp. EMBOSSED', pp. *-bŏst'*, said of a deer foaming at the mouth from hard running.

EMBOSS, v. *ĕm-bŏs′* [OF. *embosquer;* Sp. *embascar;* It. *imboscare,* to hide in a wood]: in *OE.*, to hide or conceal in a wood or thicket; to plunge into deeply.

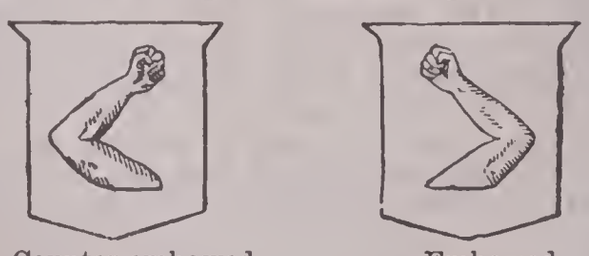
EMBOSS, v. *ĕm-bŏs′* [F. *embosser,* to swell or rise in bunches; *bosse,* a hump or boss (see Boss 1)]: to cover with raised ornamental work; to form with bosses or protuberances. EMBOS′SING, imp.: N. the forming of raised ornaments on any surface of paper, leather, wood, metal, etc. EMBOSSED′, pp. *-bŏst′*, having embossments. EMBOS′SER, n. one who. EMBOSS′MENT, n, raised work: figures in relief. —Embossing is usually effected by pressing the substance into a die, the kind of die and mode of applying the pressure being modified according to the nature of the design and the properties of the substance to be embossed. Sheet-metal is embossed by stamping it between a pair of steel dies, one in relief, the other in intaglio: see DIE-SINKING. When the pattern is a deep one, several pairs of dies are used, and several blows given with each, the metal being occasionally annealed. The first stamping produces a crude resemblance to the final design, of moderate depth; successive stampings bringing up more of the details, and giving increased depth. The upper die is usually raised by a rope, attached over a pulley to a stirrup, in which the workman places his foot; he draws his foot down to raise the heavy die to the required height, and then suddenly releases the pressure of his foot from the stirrup, when the die descends by its own weight. While thus raising the die with his foot, he adjusts the work in its place with his hands. Smaller work is embossed with a screw-press, the lever of which is turned with one hand, while the work is placed under the dies and removed by the other. Paper and card are embossed in a similar manner, but the dies are frequently of brass, sometimes of copper electro-deposits, suitably backed. The counter die is commonly made of soft metal, card or mill board, pressed into the metal intaglio die until a sharp impression is produced. The paper or card is well damped and a fly-press is generally used. The leather or cloth for bookbinding is embossed in this manner, the counter-die being usually made by gluing several pieces of millboard together, and gluing them to the upper bed of the press, then stamping these into the lower die until a perfect impression is obtained. The embossing press designed and constructed by Edwin Hill, for impressing the medallion upon postage envelopes, is a very elaborate and beautiful machine, which inks the die itself, and with the aid of two boys, to place and remove the envelopes, embosses 60 envelopes in a minute. When large surfaces of textile fabrics, such as table-covers, etc., have to be embossed, the fabric is compressed between rollers, one being of metal, upon which the device is sunk like a die; the counter-roller or bed-cylinder is of paper covered with felt; this yields sufficiently to allow the fabric to be pressed into the die-cylinder. A third smooth metal roller is commonly used to press out again the impression made upon the bed-cylinder;

this acts upon the bed-cylinder on the side from which the fabric emerges. Paper is sometimes embossed in this manner; and the flatting roller may be dispensed with if the cylinders are sufficiently accurate in their diameters for the pattern always to fall on the same place at each successive revolution. Leather embossed in high relief has been used for ornamental purposes in place of wood-carving on picture-frames, cabinet-work, etc. The dies are of type-metal or electro-deposits, and the leather is softened or fulled, i.e., worked with water till it contracts and thickens, then it is pressed into the dies by suitable round pointed tools, like modelling tools, made of wood, bone. or copper. When dry, the leather is removed from the molds, and by its elasticity and shrinking it will relieve from very deep and undercut designs.—Straker's mode of embossing wood differs from all the above, and is very curious and ingenious. When wood is pressed and rubbed with a blunt instrument, the surface yields, and a depression of some depth may be made in it; if the wood be new soaked in water, the depressed portion will rise again to its original level. The process takes advantage of this property thus: The embosser rubs down the surface in those parts that are to be finally in relief; he then planes or shaves away the uncompressed portions until the bottom of the depressions are reached and made level with the new surface; the wood is then soaked; the compressed parts rise to their original level, and, of course, in doing so, rise above the portions that have been planed away, and present the required device in relief.

EMBOUCHURE, n. *ĕm'bô-shôr* or *âng'bô-shôr'* [F.—from *bouche*, a mouth]: the mouth of a river; that part of a river where it discharges itself into a sea or lake; the mouth of a cannon, or that part of a wind musical instrument, to which the lips are applied.

EMBOUND, v. *ĕm-bownd'* [*em*, in, and *bound*]: in *OE.*, to shut in; to inclose.

EMBOW, v. *ĕm-bow'* [*em*, in, and *bow*]: in *OE.*, to bend



Counter-embowed. Embowed.

like a bow; to arch. EMBOWED, heraldic term for anything bent like a bow. The illustration represents a sinister arm couped at the shoulder, embowed. When the arm is turned the reverse way, it is said to be counter-embowed.

EMBOWEL, v. *ĕm-bow'ĕl* [*em*, intensive, or with the force of L. *e*, out of, and *bowel*]: to take out the entrails or intestines of an animal; to take out internal parts; to inclose or bury in another substance. EMBOW'ELLING, imp. EMBOW'ELLED, pp. *-ĕld*, deprived of intestines. EMBOW'EL-

MENT, n. the act of taking out the bowels. EMBOW'ELLER, n. *-ĕl-ẽr*, one who.

EMBOWER, v. *ĕm-bow'r* [*em*, in, and *bower*]: to shelter with a bower; to place or rest among trees. EMBOW'ERING, imp. *-bow'rĭng*. EMBOW'ERED, pp. *-bow'rd*.

EMBRACE, v. *ĕm-brās'* [OF. *embracer;* F. *embrasser;* It. *imbracciare*, to enfold in one's arms—from *en*, in, and F. *bras;* It. *braccia;* L. *brachĭŭm*, the arm]: to take or inclose in the arms; to press or clasp to the bosom in token of affection; to seize eagerly; to include or take in; to comprehend; to accept; to admit: N. pressure to the bosom with the arms; a hug; sexual intercourse. EMBRA'CING, imp. EMRRACED', pp. *-brāst'*. EMBRA'CER, n. *-sẽr*, one who. EMBRA'CERY, n. *-sẽr-ĭ*, in *law*, an attempt to corrupt jurors or referees to one side by money, or by promises of money, or any improper influence. This offense is a species of maintenance (q.v.). It is properly regarded as a high crime. The giving of money to be distributed among jurors is embracery, though the money be not actually distributed. Not only persons attempting to influence the jury, but jurors themselves attempting unduly to bias the minds of their fellows, are guilty of embracery. The using indirect means in order to be sworn on a jury, is also embracery. EMBRACE'MENT, n. *-mĕnt*, in *OE.*, an embrace; conjugal endearment; reception.—SYN. of 'embrace, v.': to comprise; contain; include; involve; imply; clasp; hug; inclose; encircle; encompass; surround; welcome.

EMBRASURE, n. *ĕm-brā'zhûr* [F. *embraser*, to set on fire—from *braise*, glowing embers; *embrasure*, the splayed opening of a window or door for more light—*lit.*, a window from which fire is hurled]: in *fortification*, an opening in a parapet, flank of a bastion, or other part of defense-works, through which cannon are pointed. The siege-batteries of the enemy also have embrasures. Their use is, to shield as much as possible the guns, gun-carriages, gunners, and interior of the place, and yet leave spaces for the free aiming firing of the guns. Each opening slopes outward, so as to give greater sweep to the gun's action.—The sloping or spreading sides of a door or window in any wall also are called embrasures.

EMBRAVE, v. *ĕm-brāv'* [*em*, in, and *brave*]: to inspire with fortitude; to adorn; to embellish.

EMBROCATE, v. *ĕm'brō-kāt* [mid. L. *embrocātus*, poured into a vessel: It. *embrocatione*, a fomenting the head with a liquid falling upon it in the manner of rain—from It. *broca;* F. *broc*, a jug or pipkin: Gr. *embrŏchē*, a steeping, an embrocation]: to moisten and rub a diseased part with a liquid medicine. EM'BROCATING, imp. EM'BROCATED, pp. EM'BROCA'TION, n. *-kā'shŭn* [F.—L.]: the act of bathing and rubbing a diseased part with a liquid medicine; a lotion or mixture so employed: see LINIMENT.

EMBROIDER, v. *ĕm-broy′dĕr* [*em*, in or on, and F. *bordure*, the welt or hem of a garment; *broder*, to embroider]: to adorn with ornamental needle-work. EMBROI′DERING, imp.: N. the art of adorning, as cloth with needle-work. EMBROI′DERED, pp. *-dĕrd*, adorned with ornamental needle-work. EMBROID′ERER, n. *-ĕr-ĕr*, one who. EMBROID′ERY, n. *-ĕrĭ*, art of producing ornamental needlework-patterns upon fabrics of any kind; also, the product of such work. This art is coeval with the earliest and rudest manufacture of hair and woolen fabrics. It was one of the most important of the early arts in Oriental countries, where it is still practiced with great skill and diligence. It is common among the savage tribes that wear any kind of clothing. The blanket-wrapper of the Red Indian is commonly ornamented with embroidery; the Laplander embroiders upon the reindeer skin that forms his garments patterns worked with needles of reindeer bone, and thread of reindeer sinews and strips of hides. It is practiced as a domestic art, and is carried on in large manufactories by elaborate machinery.

The Chinese are perhaps the most laborious and elaborate hand-embroiderers of modern times; their best work is upon silk. The figures are either in colored silk alone, or in silk combined with gold and silver thread; the figures of men, horses, dragons, etc., being outlined with gold cord, and filled up colored and shaded with silk. The Persians, Turks, and Hindus also still excel in embroidery; they use, besides silk and gold and silver thread, beads, spangles, pearls, and precious stones. The dress-slippers of Turkish women of all ranks are elaborately embroidered, usually with a precious stone or a glass bead in the middle of the toe-part of the slipper, and a radiating pattern in gold, silver, and brass wire and silk surrounding it. The Turkey carpet is a sort of embroidered fabric: see CARPETS.

Some of the Oriental and Indian embroiderers include in their work a great variety of materials besides those above mentioned; feathers are largely and very tastefully used; skins of insects; nails, claws, and teeth of various animals; nuts, pieces of fir, skins of serpents, etc., are among these. Coins, commonly used as ornaments for the hair of unmarried women in the East, are sometimes also worked into their dresses with the embroidery—especially among the Turks and Georgians. The Indian women embroider with their own hair and that of animals.

Tapestry is a kind of embroidery, formerly with the needle, now chiefly with the shuttle. This kind of work, being intermediate between embroidery and weaving, is somewhat difficult of classification: see TAPESTRY.

For hand-embroidery by the needle, the fabric is usually stretched upon a frame, and the design to be worked is drawn upon it, or some other contrivance is used to guide the worker. If the fabric is sufficiently thin and open, a colored drawing or engraving may be placed behind the work, and followed with the needle. A sheet of thin transparent paper, with lines upon it corresponding to the threads of the canvas to be worked upon, is sometimes used: this is

secured by gum or wax to the drawing; and the design is copied by observing the number of small squares occupied by each color, and filling in the corresponding meshes of the canvas. *Berlin-work*, a kind of embroidery, is done in similar manner, the pattern being an engraving on which the lines corresponding to the thread are printed, and the meshes filled up with the required colors, painted in by hand by women and children, who copy it from the original design of the artist. The name has been given from the fact, that the best patterns have, since 1810, been published by Wittich, printseller in Berlin.

In France, pricked patterns are sometimes used, one for each color, and colored powders are dusted through the holes upon the fabric to be worked.

All these devices render the art of embroidery a mere mechanical operation, requiring no further artistic skill or taste than is exercised in knitting stockings; but when the embroidress draws the design in outline upon the fabric, and works in the colors with her needle under the guidance of her own taste, embroidery becomes an art that might rank with water-color drawing or oil painting.

Muslin-embroidery, much in vogue of late, is purely mechanical work. The muslin is printed with a pattern made up of holes of different dimensions; these are cut or punched out, and their edges sewn with a 'button-hole stitch.' This kind of work is much used as trimming for ladies' clothing, for collars, and children's clothes.

Machine-embroidery has been practiced with considerable success during the last quarter century. A machine was exhibited in the French Industrial Exhibition 1854, by M. Heilmann of Mulhausen, by which one person could guide from 80 to 140 needles, all working at the same time, and producing so many repetitions of the same design. Though the details of the construction of this machine are rather complex, the principle of its action may be easily understood. The needles have their eyes in the middle, and are pointed at each end, so that they may pass through from one side of the work to the other without being turned. Each needle is worked by two pairs of artificial fingers or pincers, one on each side of the work; they grasp and push the needle through from one side to the other. A carriage or frame connected with each series of fingers does the work of the arm, by carrying the fingers to a distance corresponding to the whole length of the thread, as soon as the needle has passed completely through the work. The frame then returns to exactly its original place, and the needles are again passed through to the opposite set of fingers, which act in like manner. If the work were to remain stationary, the needles would thus pass merely backward and forward through the same hole and make no stitch; but by moving the work as this action proceeds, stitches will be made, their length and direction varying with the velocity and the direction in which the work moves. If 140 needles were working, and the fabric were moved in a straight line, 140 rows of stitching would be made; if the work made a circular movement, 140 circles would be em-

broidered; and so on. In order, then, to produce repetitions of any given design, it is only necessary to move the fabric in directions corresponding to the lines of the design. This is done by connecting the frame on which the work is fixed to an apparatus similar to a common pantagraph, or instrument so constructed that one end repeats on a smaller sale exactly the movements which are given to the other: see PANTAGRAPH.

Although it is *possible* to embroider any design with such machines, there are only certain designs that can be worked economically; for to do this, the patterns must be so designed as to consume each needleful of silk without waste. The length of silk required for each color can be calculated with extreme accuracy, and the designer is usually limited by this requirement. A greater range is, however, obtainable by dyeing the same thread of silk in different colors, the length of each color corresponding to what is required for producing the pattern; but a large demand for each pattern is required to render this profitable.

EMBROIL, v. *ĕm-broyl′* [F. *embrouiller*, to perplex, to entangle—from *em*, in; *brouiller*, to jumble, to mix]: to involve in troubles or perplexities; to entangle; to distract. EMBROIL′ING, imp. EMBROILED′, pp. *-broyld*. EMBROIL′MENT, n. confusion; disturbance.—SYN. of 'embroil': to perplex; encumber; mingle; disturb; trouble; disorder; confound.

EMBRUE, v. *ĕm-brô′*: see IMBRUE.

EMBRUN, *ĕm′brŭn* F. *ŏng-brŭng′*: town of France, dept. of Hautes Alpes, on a platform of rock in the midst of a plain, on the right bank of the Durance, 20 m. e. of Gap. From a distance, the town has an imposing appearance. The streets of Embrun are narrow, dirty, and irregular. It is surrounded by loopholed ramparts and ditches, and strengthened by bastions. The principal buildings are the cathedral, a Gothic edifice, surmounted by a lofty Romanesque tower, and the barrack, formerly the archbishop's palace. Embrun manufactures broadcloth, counterpanes, hats, cotton-yarn, and leather. Embrun occupies the site of the anc. Ebrodunum, cap. of the Caturiges, an important Roman station. The line of its archbishops can, it is said, be traced to the time of Constantine. In modern times Embrun has been thrice destroyed by fire: by the Moors 966, during the religious wars 1573, and by the Duke of Savoy 1692, Pop. 4,481.

EMBRYO, n. *ĕm′brĭ-ō*, EM′BRYON, n. *-ŏn* [F. *embryon*—from Gr. *embrŭŏn*, an infant in the womb—from *em*, in; *brŭō*, I shoot or bud—*lit.*, that which forms or swells inside something]: an organized being in a rudimentary condition, or the rudiment from which under proper conditions, an organized body is to be developed. In botany, the term embryo is applied to the germ formed within the ovule on fertilization, which increases to become the principal part of the seed. The albumen or

perisperm of the seed, being regarded as a mere store of nourishment for the embryo, is not accounted part of the embryo; the cotyledons, however—though a large store of nourishment is often laid up in them—are considered as essentially belonging to it, with the *plumule*, the *radicle*, and the connecting parts. As to animals, the term embryo is used as equivalent to *fœtus*, and as designating the rudimentary animal from the moment of impregnation until the egg is hatched, or until the young animal is discharged from the womb; but the term embryo is not applied to the *larvæ* and *pupæ* of insects, or to the analogous states of other classes of animals. Eggs contain, with the embryo, a store of nourishment for it in the earlier stages of its development. See Reproduction: Development of the Embryo: Egg: Fœtus: Ovule: Seed: Spore—Embryo is applied figuratively to the first state or beginning of anything; anything before it assumes its distinct form: Adj. rudimentary. Em′bryon′ic, a. *-ŏn′ik*, or Em′bryon′ary, a. *-ėr′ĭ*, and Em′bryon′al, a. *-ŏn′ăl*, relating to an embryo; rudimentary. Em′bryog′eny, n. *-ŏj′ĕ-nĭ* [Gr. *genos*, offspring, race]: in *bot.*, the development of the embryo in the ovule. Em′bryol′ogy, n. *-ŏl′ŏ-jĭ* [Gr. *logos*, a discourse]: the study of the formation of the embryo (see Development of the Embryo). Em′bryol′ogist, n. *-jĭst*, one who is versed in. Em′bryot′omy, n. *-ŏt′ŏ-mĭ* [Gr. *tŏmē*, a cutting]: division of the fetus into fragments, by incision, with its extraction in pieces, when narrowness of the pelvis or other faulty conformation opposes delivery. Embryo-buds, nodules in the bark of the birch and other trees. Embryo-sac or Embryonary-sac, the cellular bag in which the embryo is found. Em′bryot′ega, n. *-ŏt′ĕ-gă* [Gr. *tegos*, a covering]: a process or callosity raised from the spermoderm by the embryo of some seeds during germination, as in the bean.

EMBURY, *ĕm′bėr-ĭ*, Philip: 1729, Sep. 21—1775, Aug.; b. Ballygaran, Ireland: father of American Methodism. He was educated in a local school, learned the carpenters' trade, joined the Meth. Church 1752, appointed a local preacher of Wesley's scoiety at Court Mattress, Ireland, 1758, emigrated to New York 1760, and worked at his trade till 1766, when, at the instigation of Barbara Heck, he began preaching in his own house. At first his auditors were chiefly of his Irish countrymen, but as others were attracted to his services he opened a meeting-room in an old sail-loft on the present William street, and preached there till he had gathered a congregation large enough to warrant the erection of a church. In 1768 the first Methodist church in the United States was built on John street, Embury doing a large part of the carpenter work himself, and building his own pulpit, from which he dedicated the structure Oct. 30. He preached there gratuitously till 1769, when he resigned the charge and removed to Camden (now Salem), Washington co., N. Y., where he worked at his trade and founded another church, the germ of the present Troy conference of the Meth. Episc. Church.

EMDEN, *ĕm′dĕn:* town in the province of Hanover, formerly in the principality of East Friesland, a little below the embouchure of the Ems into Dollart Bay; lat. 53° 22′ n., long. 7° 13′ e. It lies low, but is protected by strong dikes from inroad of the waters of the bay. Nevertheless, occasional inundations take place; as in 1826, when for three months the water was as high as the first floor of the houses. Emden, which is the chief commercial town of Hanover, is surrounded by walls and towers, is well built, has spacious and well paved streets, and houses remarkable for their appearance of comfort, and for extreme cleanliness. It is intersected by numerous canals which are crossed by about 30 bridges. The Delf canal runs s. from the town to Dollart Bay, about two m., but it can be entered at high water only, and even then is not navigable for vessels of more than 13 or 14 ft. draught; all vessels of greater draught having to unload in the roadstead of Delf, at the mouth of the canal. The principal building, and one of the finest public edifices in the whole region, is the town-hall, containing a library and a curious collection of ancient arms and armor. Emden stands in a district of great fertility. It has much of ship-building, besides various other manufactures. From this town, from 50 to 60 vessels are sent out to the herring-fishing off Scotland. Emden was made a free port 1751, came into the possession of Holland 1808, and with the whole of E. Friesland, was incorporated with the kingdom of Hanover 1815. Pop. 13,695.

EMEND, v. *ĕ-mĕnd′* [F. *émender*—from L. *emendārĕ*, to correct; *emendātus*, corrected—from *e*, out of; *mendum*, a fault: It. *emendare*]: to make corrections on a literary work. EMENDATION, n. *ĕm′ĕn-dā′shŭn*, the act of altering or changing for the better; correction of an error or fault; improvement. EM′ENDA′TOR, n. *-tėr*, one who corrects errors in writings, or improves them. EMEN′DATORY, a. *-dă-tėr-ĭ*, contributing to emendation.—SYN. of 'emend': to amend; correct; reform; rectify; improve; better; perfect.

EMENDALS, n. *ĕ-mĕnd′als:* term in old accounts, signifying the sum total in stock.

EMERALD, n. *ĕm′ĕr-ăld* [Sp. *esmeralda;* L. *smaragdus;* Gr. *smaragdos;* OF. *esmeraude;* F. *émeraude:* name originally Semitic, or at least eastern, but signification unknown]: a bright green variety of beryl, i.e., of beryllium oxide; the color is due to a trace of chromium oxide (q.v.). Its specific gravity is 2.577–2.725. In hardness it is slightly inferior to topaz. The localities in which emerald is found are very few. The finest emeralds have long been brought from S. America, where they are obtained from veins traversing clayslate, horn blende slate, and granite, in a variety not far from Santa Fé de Bogota. Emeralds of inferior quality are found in Europe, imbedded in mica-slate in the Henbach Valley in Salzburg.

They are found also in the Ural; in old mines in Upper Egypt; large and fine in N. Carolina; light-yellow in Alabama; and aquamarine in Colorado. This gem, known from very early times, was highly prized. Pliny states that when Lucullus landed at Alexandria, Ptolemy offered him an emerald set in gold, with his portrait engraven on it. Many wrought emeralds have been found in the ruins of Thebes. Nero, who was near-sighted, looked at the combats of gladiators through an eye-glass of emerald and concave eye-glasses of emerald seem to have been particularly esteemed among the ancients. As a precious stone, the emerald is rarely without flaw. Its value depends much on its color. A very perfect emerald of six carats has been sold for $5,000.

It is probable that emeralds have been found in the East, in localities not at present known, but the name emerald or ORIENTAL EMERALD is often given to a very rare, beautiful, and precious green variety of SAPPHIRE (q.v.).

EMERALD COPPER is a beautiful and very rare emerald green crystallized mineral, called also DIOPTASE, found only in the Kirghis Steppe, and composed of about 39 parts silica, 50 protoxide of copper, and 11 water.

EMERALD GREEN, a term applied to a variety of green pigments, the one in general use in the United States being the aceto-arsenite of copper known as PARIS GREEN (q.v.). The term is also used as a trade name of chromic oxide, $Cr_2 O_3$, which is generally prepared by heating boric acid, $H_3 BO_3$, with potassium bichromate, $K_2 Cr_2 O_7$. The exact color and brilliancy of the material depends essentially on the details of its preparation, i.e., on its physical state and fineness of division. Occasionally charcoal or sulphur are employed instead of the boric acid.

EMERALD ISLE, name applied to Ireland in reference to its bright verdure.

EMERGE, v. *ĕ-mėrj′* [L. *emergĕrĕ*, to rise; to come forth—from *e*, out of; *mergo*, I plunge or dip]: to rise from beneath a surface, as of water; to rise from a low to a higher station or condition; to issue; to proceed from; to reappear; to rise into view; to become a reality. EMER′GING, imp. EMERGED′, pp. *-mėrjd′*. EMER′GENT, a. *-mėr′jĕnt*, rising out of; coming suddenly; pressing. EMER′GENTLY, ad. *-lĭ*. EMER′GENCE, n. *-jĕns*, or EMER′GENCY, n. *-jĕn-sĭ*, that which comes suddenly; a sudden occasion; anything calling for immediate action; pressing necessity. EMERSION, n. *ĕ-mėr′shŭn* [L. *emersus*, risen up]: the act of appearing to view; in *astron.*, reappearance of one heavenly body from behind another, after an eclipse or occultation. The immersions and emersions of Jupiter's first satellite are particularly useful for finding the longitude of places. Minutes or scruples of emersion are the arc of the moon's orbit passed over by her centre, from the time she begins to emerge from the earth's shadow to the end of the eclipse. EMERGENT-YEAR, n.

epoch or date from which any people begin to compute their time.

EMERITUS, a. *ē-mĕr'ĭ-tŭs* [L. *emerĭtŭs*, a veteran—from *e*, out of; *mĕrĕō*, I deserve; It. *emerito;* F. *émérite*]: honorably relieved from public duty on account of age or long and faithful services—said of a professor in a college, or the pastor of a church, relieved but retained in connection.

EMERODS, n. plu. *ĕm'ėr-ŏdz* [a contraction of *hemorrhoids:* Gr. *haimorrhoides*—from *haima,* blood, and *rhĕō,* I flow]: painful and bleeding tubercles about the anus; piles.

EMERSION: see under EMERGE.

EMERSON, *ĕm'ėr-son*, RALPH WALDO, LL.D.: 1803, May 25—1882, Apr. 27; b. Boston: philosopher and poet. He was son of William Emerson, pastor of the First Church (Congl.) in Boston, and was in descent the eighth in a line of Puritan ministers. He graduated at Harvard 1821, and taught for several years in a girls' school of which his elder brother was principal, at the same time studying theology. In 1829 he became colleague of Henry Ware in the pastorate of the Second Church (Unitarian) in Boston. A year afterward Mr. Ware was chosen prof. of pulpit eloquence in Harvard College, and Emerson became sole pastor of the Second Church. Four years afterward he came to the conclusion that the usual mode of administering the Lord's Supper was not merely unwarranted by Scripture, but was also not beneficial to those participating. His congregation were not willing that any change should be introduced; and Emerson resigned his charge, and early in 1833 sailed for Europe, where he remained nearly a year, mostly in Italy. Before returning to America he went to England and Scotland, his special purpose being to see Carlyle, whom he regarded as 'the strongest contributor to the critical journals.' Carlyle was then residing at the lonely farm of Craigenputtock, 15 m. from any considerable town. The interview, of only a few hours, resulted in a warm friendship, ended only by death.

Returning to America, Emerson at once began his career as a lecturer. His first lecture on 'Water' was delivered before the Mechanics' Association of Boston; this was followed by three others describing his visit to Italy, then by one on the 'Relations of Man to the Globe.' In 1834, he delivered a series of five lectures upon Michael Angelo, Milton, Luther, George Fox, and Edmund Burke; the first two of which, published in the *North American Review,* were his first appearance in print. In 1835 he married, and took up his residence at Concord, 20 m. from Boston, which was his residence for the remaining 47 years of his life. For 40 years he lectured in all the important towns in the Union; his principal courses being 10 lectures on 'English History,' 12 on the 'Philosophy of History,' 10, on 'Human Culture,' 10 on 'Human Life,'

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10 on 'The Present Age,' 7 on 'The Times.' In 1847, he went to Great Britain on a lecturing tour, and delivered a course on 'Representative Men,' and another on 'Mind and Manners in the Nineteenth Century.' None of these courses have been published as a whole, though the subject-matter of some has been embodied in his books.

Emerson's published works, arranged in the order of their first publication, are as follows: *Nature*, 1836; *Poems*, 1846; *Essays*, First Series, 1841; Second Series, 1847; *Miscellanies*, consisting of collegiate and other addresses; most of which had already been printed in *The Dial*, 1849; *Representative Men*, 1850; *English Traits*, 1856; *Conduct of Life*, 1860; *May-Day and other Poems*, 1867; *Society and Solitude*, 1870; *Letters and Social Aims*, 1875. Besides these he furnished several chapters of the *Life* of Margaret Fuller Ossoli whom, in 1842, he succeeded as editor of *The Dial*, to which he contributed largely during the four years of its existence. Not long after his death two vols. made up from his manuscripts were published, as was also his correspondence with Carlyle.

The two series of *Essays* are the works with which—and his early volume entitled *Nature*—the name of Emerson is usually associated; though the volume on *Representative Men—Plato, the Philosopher; Swedenborg, the Mystic; Montaigne, the Skeptic; Shakespeare, the Poet; Napoleon, the Man of the World*, and *Goethe, the Writer*—are quite as characteristic of the author as anything which he ever wrote. The sketch of Plato is clearly the one on which he lavished his best powers. 'Among books,' he says, 'Plato is entitled to Omar's fanatical compliment, "Burn all the libraries; for their value is in this book." The writings of Plato contain the culture of nations; these are the corner-stone of schools; these are the fountain-head of literatures. . . . No wife, no children has he; and the thinkers of all civilized nations are his posterity, and are tinged with his mind.'

Anything like a system of philosophy cannot be educed from the utterances of Emerson. In his early manhood he perhaps might properly have been styled an Idealist. In the chapter on Idealism, in *Nature*, he says: 'A noble doubt perpetually suggests itself, whether Nature outwardly exists. It is a sufficient account of the Appearance we call the World, that God will teach a human mind, and so make it the receiver of a certain number of congruent sensations. In my utter impotence to test the authenticity of the report of my senses—to know whether the impressions they make on me correspond with outlying objects—what difference does it make whether Orion is up there in heaven, or some god paints the image in the firmament of the soul . . . Whether Nature enjoys a substantial existence without, or is only an apocalypse of the mind, it is alike useful and venerable to me. Be it what it may, it is ideal to me, so long as I cannot try the accuracy of my senses. . . . Three problems are put by Nature to the mind: "What is matter? Whence is it? and

Whereto?" The first of these questions only the Ideal theory answers. Idealism saith: "Matter is a phenomenon, not a substance." Idealism acquaints us with the total disparity between the evidence of our own being and the evidence of the world's being. The one is perfect, the other incapable of any assurance; the mind is part of the nature of things; the world is a divine dream from which we may presently awake to the glories and certainties of day. Idealism is a hypothesis to account for Nature by other principles than those of carpentry and chemistry. Yet if it only deny the existence of matter, it does not satisfy the demands of Spirit. It leaves God out of me. It leaves me in the splendid labyrinth of my perceptions, to wander without end. Then the heart resists it, because it balks the affections in denying substantive existence to men and women. Nature is so pervaded with human life that there is something of humanity in all, and in every particular. But this theory makes Nature foreign to us, and does not account for that consanguinity which we acknowledge to it. Let it stand, then, in the present state of our knowledge, merely as a useful introductory hypothesis, serving to apprise us of the eternal distinction between the Soul and the World.'

Emerson's teachings relate almost solely to our present earthly life, in respect to which they are mostly noble and exalted. But he knows nothing of a possible previous existence, and, unlike Plato, he never speculates about any such thing. He has also very little to say of a future life, and that far from definite. He indeed mentions, almost incidentally, that he and Carlyle sat one August morning upon the hillside, and 'talked of the immortality of the soul'—a topic evidently of Emerson's suggesting; for, as he says, 'Carlyle did not like to place himself where no step can be taken.' It is clear enough that Emerson in early manhood accepted the doctrine of the immortality of the soul in its ordinary acceptation. But it is equally clear that in after life his idea of it became far less definite. We find his most matured thought on this subject nowhere so fully expressed as in the chapter on Immortality in his *Letters and Social Aims*. At the very outset he scouts at the idea that any such thing was taught by Jesus. 'It is very strange,' he says, 'that Jesus is esteemed by mankind the bringer of the doctrine of immortality. He is never once weak or sentimental; he is very abstemious of explanation; he never preaches the personal immortality, whilst Plato and Cicero had both allowed themselves to over-step the stern limits of the spirit, and gratify the people with that picture.' His own conclusion as to the immortality of the human soul is thus expressed: 'I confess that everything connected with our personality fails. Nature never spares the individual. We are always balked of a complete success. No prosperity is promised to that. We have our indemnity only in the success of that to which we belong. That

is immortal, and we only through that. The soul stipulates for no private good. That which is private I see not to be good. . . . Is immortality only an intellectual quality; or, shall I say only an energy, there being no passive? He has it, and he alone, who gives life to all names, persons, things where he comes. No religion, not the wildest mythology, dies for him. He vivifies what he touches. Future state is an illusion for the ever-present state. It is not length of life, but depth of life. It is not duration, but a taking of the soul out of time, as all high action of the mind does.'

That Emerson's dicta are not always consistent with each other—that he often says one thing at one time and a quite different thing at another time—is beyond question. No one is more prompt to acknowledge this than he himself. He not only acknowledges it, but justifies it. In his essay on Self-Reliance he says: 'One terror that scares us from self-trust is our "consistency," a reverence for past act or word, because the eyes of others have no data for computing our orbit other than our own past acts, and we are loth to disappoint them. . . . Suppose you should contradict yourselves—what then? . . A foolish consistency is the hobgoblin of little minds, adored by little statesmen and philosophers and divines. With consistency a great soul has little or nothing to do. He may as well concern himself with his shadow on the wall. Speak what you think now, in hard words; and to-morrow speak what to-morrow thinks, in hard words again, though it contradicts everything you said to day. "Ah, so you shall be misunderstood!" Is it so bad, then, to be misunderstood? Pythagoras was misunderstood, and Socrates, and Jesus, and Luther, and Copernicus, Galileo, and Newton, and every wise spirit that ever took flesh. To be great is to be misunderstood.'

This refusal of consistency was characteristic of his whole mental method, which, at least on this point was curiously self-consistent. He was unchangeably transcendentalist and mystic. Thus, in some utterances he was considered to speak as a pantheist, yet the whole trend of his thinking cannot be said to accord with that system nor indeed with any other. He spoke of God, man, and the universe rather from their aspect, than from any set of established convictions regarding their essence and reality. Thus, again, some of his later utterances were claimed by adherents of evangelical Christianity to verge toward that system. They were certainly notable from him; for instance this, from his intimate friend A. Bronson Alcott: 'I do not care to classify myself with any painstaking accuracy with this sect or with that; but if I am to have any appellation at all of a religious kind, I prefer to be called a Christian theist. You must not leave out the word Christian, for to leave out that is to leave out everything.' The spirit of such words is certainly genial and Christian, but it is probably unwise to take them as indicating a new philosophical departure. Emerson's

superb mysticism—lacking power equally for construction or destruction of any system—renders its chief service through its wonderful ethical suggestiveness and its swift glimpes of grand though unrelated truths.

Emerson's place as a philosophical thinker may even now be fairly assigned. It is probable that no man of his century exerted a wider influence on the thought of his time. Like Plato, he was not the founder or exponent of any school of philosophy or ethics; but his thinking, like that of Plato, is an enduring force. It is not so easy to assign his place as a poet. Considering that he wrote verse at intervals for more than 30 years, his poetical productions are not numerous: a single small volume would contain all of them. No one poem exceeds about 600 lines, and few have a quarter as many. But there are not a few who hold that were it not for defects in rhythm and metre his place would be with the first poets of his day. Without attempting to fix his exact status, we may say that his poem in memory of his brother, Edward Bliss Emerson, the Threnody for his own dead boy, the May-Day, and the Hymn of Nature, will have a life as long as that of any poem in the English language produced in this century.

Emerson died at Concord, which for nearly half a century had been his home.

EMERY, n. *ĕm'ĕr-ĭ* [F. *émeri*, a black-hard mineral—from It. *smeriglio:* Gr. *smuris*, emery: Sp. *esmerar*, to polish, or cleanse]: variety of corundum (q.v.), or of the same mineral species of which corundum and sapphire (with oriental ruby, etc.) also are varieties. All of these are more or less impure aluminium oxide Al_2O_3, they have the same hardness and specific gravity; but emery is dull, opaque, and not crystallized, sometimes of grayish black, sometimes of blue color. It occurs both massive and disseminated. Its masses, though very compact, have a somewhat granular structure. It is found in several parts of Europe, in Asia Minor, Greenland, etc., generally in aggregates scattered through aqueous deposits. Emery of fine quality is found in Chester, Mass., and other localities. Being very hard, it is much used for grinding glass and polishing metals and other hard substances. It is composed of alumina, ferric oxide, and silica, with a little lime, in proportions varying considerably with different specimens. The following may be taken as an average: alumina, 72; ferric oxide, 9; silica, 5; lime, 1; water, 3. The emery of commerce, especially that used in in emery-paper etc., is sometimes adulterated with garnet, zircon, and other substances harder than quartz-sand.

It is prepared for use by first breaking it into lumps about the size of a hen's egg, then crushing these to powder by stampers. It is then sifted to various degrees of fineness, numbered according to the meshes of the sieve. Plate-glass manufacturers and others separate emery powder into different degrees of fineness by *elutriation* (q.v.). Elutriation in oil or gum-water is sometimes

used on a smaller scale, the emery being stirred up in the liquid, and portions poured off at different intervals of time, the finest being, of course, the last to settle. The use of the oil or gum is to make the subsidence take place more slowly. On account of its hardness it is used for cutting and polishing many kinds of stone. Glass stoppers of all kinds are ground into their fittings with it. Plate-glass is ground flat by its means; it is also used in glass-cutting, and in grinding some kinds of metallic fittings. When used in polishing metals, it has to be spread on some kind of surface to form a sort of fine file. EMERY PAPER is made by sifting emery over paper which has been covered with a coating of glue. It is used either by wrapping it round a fine file, or a stick, or in the hand, according to the form of the work: see POLISHING OF METALS. EMERY CLOTH is made like emery paper, with coarse calico substituted for the paper. The emery does not adhere so well as to paper, and it is therefore not used by metal-workers, who work emery paper till smooth with wear, but is used chiefly for purposes where the hand alone is used, and paper would tear. EMERY STICKS are used for the same purposes as emery paper wrapped round files; they are made of deal sticks shaped like files, then glued over, and dipped once or twice in a heap of emery. EMERY CAKE, is a compound of bees-wax, suet, and emery, melted and well worked together. It is applied to buffing wheels, etc. EMERY STONE is a kind of earthenware mixed with emery formed by pressing a mixture of clay and emery into suitable molds and then firing, like common earthenware. It is molded into wheels, laps, etc. The smaller sizes of these are used by dentists for grinding teeth. EMERY-WHEEL, leaden wheel in which emery is embedded by pressure, or, more commonly, a wooden wheel covered with leather and with a surface of emery. Its principal use is in grinding and polishing metallic articles, especially cutlery. In more recent years emery has been largely superseded by CARBORUNDUM (q.v.).

EM'ERY, CHARLES EDWARD: civil engineer; b. Aurora, N. Y., 1838, Mar. 29. He entered the U. S. navy as 3d asst. eng. 1861, was promoted 2d asst. eng. 1862, took part in the engagements at Pensacola, on the Mississippi river, and at Mobile, and in the blockade of Charleston, and resigned 1867, Dec. Subsequently he became consulting eng. of the U. S. coast survey and U. S. revenue marine, conducted experiments with chief eng. Charles H. Loring to determine the relative value of compound and non-compound engines, and was appointed eng. of the New York Steam-heating Company 1879. In that capacity he constructed the entire plant of the company, and invented almost all the devices employed in the generation and distribution of the steam. He was a non-resident prof. of Cornell Univ., member of the American Soc. of Civil Engineers and the American Soc. of Mechanical Engineers, and received the degree PH.D. from the Univ. of New York 1879. He died in 1898.

EM'ESA: see HEMS.

EMETIC, n. *ĕ-mĕt'ĭk* [F. *émétique*—from Gr. *emetĭkŏs*, that causes vomiting—from Gr. *emĕō*, I vomit: L. *emetĭca*, an emetic]: substance which, administered internally, causes vomiting (q.v.). Such substances are given when it is desirable to relieve the stomach of some noxious or indigestible substance, as a narcotic poison, or excess of food, or some special article of diet which has disagreed. Emetics were formerly administered also in cases of fever, where the copious secretion that they produce from the glands of the stomach and intestines was supposed to have a directly curative effect, aided, perhaps, by the sedative action of emetics upon the circulation and nervous system. In diseases of the respiratory organs, emetics are even now sometimes given as the quickest and safest method of removing accumulated mucus from the air-passages; and in croup (q.v.), their action is especially favorable, being often followed by expectoration and rapid improvement in the suffocation symptoms. Emetics are to be given with great caution, however, in all very depressed states of the system, as their primary action is to produce nausea (q.v.), which is attended always with diminution of the vital power, and often with great depression of the heart's action, amounting to syncope or fainting. The principal emetics are the preparations of antimony, zinc, and copper; ipecacuanha in powder or in wine; squill, lobelia, and, generally speaking, the whole class of expectorants and irritants; the latter of which, however, with the exception of sulphate of zinc, and perhaps mustard and water, form a dangerous kind of emetics, which should never be administered when the milder kinds can be procured. One of the most powerful and quickly acting emetics, which is moreover attended as a rule with little or no nausea, is apomorphine, a derivative of the alkaloid morphine. EMET'IC, a. that causes vomiting. EMET'ICALLY, ad. *-ĭ-kăl-ĭ*. EMETINE, n. *ĕm'ĕ-tĭn*, alkaloid which forms the active principle of ipecacuanha root. It is a yellowish-white powder, slightly soluble in cold water, but dissolving readily in alcohol. When taken internally, it exhibits violent emetic properties, $\frac{1}{10}$th of a grain being sufficient to cause vomiting. See IPECACUANHA.

EMEU: see EMU.

ÉMEUTE, n. *ā-mūt'* [F. *émeute*, an uproar—from L. *exmōtă*, that which is disturbed—from L. *e; mōtus*, a moving]: a tumultuous mob; a seditious commotion; a popular tumult or riot.

EMIGRATE, v. *ĕm'ĭ-grāt* [L. *emĭgrātus*, removed or departed form a place—from *e*, out of; *mīgrō*, I wander: It. *emigrare:* F. *émigrer*]: to leave one's native country to reside permanently in another. EM'IGRATING, imp. EM'IGRATED, pp. EM'IGRANT, n. [F.—L.]: one who emigrates. EM'IGRA'TION, n. *-ĭ-grā'shŭn* [F.—L.]: removal to dwell or settle in another country.

EMIGRATION.

EMIGRA'TION: passing from one part of the world to another for the purpose of permanent settlement. In the country which people leave, they are called emigrants or wanderers out—in that in which they settle, they are usually called immigrants.

The Greeks were addicted to emigration owing, it has been said, to the many political contests which drove the weaker party from home. Greek emigrants planted colonies on the borders of the Mediterranean and the Black Sea, carrying them as far n. as France, where they established the city of Marseille. The Romans were great colonizers, but by conquest rather than emigration. They disliked leaving Italy; and the military and civil officers necessary to rule a colony were generally the only Romans who abode in it.

The migrations of the northern tribes who overran the Roman empire, are well known in history; their wanderings may be said, indeed, to have continued till the 13th c. Those who wandered from the n. into France, where they acquired great territories, became known as Normans, and were remarkable for entirely throwing off the language and manners, and even all the traditions of their original homes, and becoming the most civilized and courtly portion of the French people. But though thus changed, they continued to wander, spreading over Britain, Sicily, and intervening portions of Europe.

The discovery of America opened a vast new field for emigration, which was immediately entered by the Spanish and Portuguese; and later, by the British, French, Germans, and Dutch. In the 17th c., many of the English Puritans, persecuted in, or discontented with, their own country, found it desirable, or thought it duty, to establish themselves in a new country where they could give their principles free development; and these pilgrims founded the New England colonies. The great emigration fields at the present day are the United States, Canada, Australia, New Zealand, Argentina, and South Africa.

As a question in political economy, opinions about emigration have oscillated violently. At one time it has been prohibited, at another encouraged by all kinds of tempting offers held out to emigrants, while teachers of political economy have proclaimed that there can never be too much emigration. The conclusion to which we are coming in this, as in so many other questions in political economy is, that what is good for the individual members of a community is good for the community collectively—if people can improve their condition by emigrating, it is well that they should emigrate; otherwise, it is better for the community that they stay at home.

The standard difficulty is the want of adjustment of capital to labor. This is enhanced by the circumstance, that those who wish to emigrate are generally persons feeling the pressure of poverty at home. The man, however, who goes to a place where there is no capital to employ him with —either his own or some other person's—is just in the pos-

ition of a shipwrecked marine cast on a desert shore. Government interference has been found neeessary for protection of emigrants. The intending emigrant, before he leaves his own eountry, can, through means of agents, not only be shipped for a distant port, but ean contract for his removal inland to his final place of settlement, and ean even contract for the purchase of a plot of ground, and sometimes for the sale of his labor. The temptations and the opportunities for imposition in contracts to be fulfilled so far away from the place where they are undertaken, have eaused the Brit. govt. and U. S. govt. to eo-operate for the proteetion of emigrants to this country.—For statistics see IMMIGRATION.

ÉMIGRÉS, *ā-mē-grā* [Fr.]: name given espeeially to those persons who quitted France during the Revolution. After the insurrection at Paris, and the taking of the Bastile, 1789, July 14, the prinees of the royal family departed from France. They were followed, after the adoption of the eonstitution of 1791, by all who considered themselves aggrieved by the destruction of their privileges, or who were exposed to perseeution. Nobles quitted their châteaus; offieers, with whole companies, passed the frontiers. Crowds of priests and monks fled to eseape the oath of allegiance to the constitution. Belgium, Piedmont, Holland, Switzerland, and, above all, Germany, were overrun with fugitives of every age. Only a few had been able to save their property; the greater portion were in destitution, and sank into utter demoralization. A court had formed itself round the princes at Coblenz; a government, with ministers and a eourt of justiee, had been established, and communieation was kept up with all the foreign courts unfavorable to the Revolution. This conduct imbittered Franee, aggravated the position of the king, and drove the revolutionary party forward in their sanguinary career. Under the command of the Prince of Condé, a body of the émigrés was formed, whieh followed the Prussian army into Champagne. The result was that the severest laws were now put in force against the émigrés. Their lands were confiseated. The penalty of death was proclaimed against any one who should support or enter into communieation with them. 30,000 persons were plaeed upon the list of émigrés, and exiled forever from the soil of Franee, though many of them had refused to bear arms against their country. Not until after the failure of their attempt to land at Quiberon, 1795, did the émigrés abandon all thoughts of penetrating into France by force of arms. Condé's corps, after the peace of Luneville, was obliged formally to dissolve, and sought asylum in Russia. Even under the Directory, however, many had endeavored to obtain permission to return to Franee. The general amnesty proelaimed by the First Consul was therefore joyfully hailed by the greater portion of the émigrés. Many, however, did not return home till after the downfall of Napoleon. Dignities, pensions, and offiees were now showered upon these faithful adherents; but, according to the eharter of 1814, they were unable to

recover either their estates or their privileges. Finally, on the motion of the minister Villèle, the émigrés who had lost their landed estates, by the law of 1825, Apr. 27, received a compensation of 30 million francs yearly on the capital of 1,000 million francs. After the July revolution, however, the grant was withdrawn. Compare Antoine de Saint-Gervais, *Histoire des Émigrés Français* (3 vols. Paris 1823), and Montrol, *Histoire de l'Émigration* (2d edit. Paris 1825).

EMILIAN, *ē-mĭl'ĭ-an* (or ÆMILIAN, *ē-mĭl'ĭ-an*) PROV'INCES: portion of the recently formed kingdom of Italy, comprising the n. part of the States of the Church (the Romagna), and the duchies of Parma and Modena. The name is derived from the ancient Roman *Via Æmilia* (a continuation of the *Via Flaminia*, or great n. road), which passed through these territories. The E. P. were formally annexed to Sardinia 1860, Apr. See ITALY.

EMINENT, a. *ĕm'ĭ-nĕnt* [F. *éminent*—from L. *eminen'tem*, standing out, distinguished—from *e*, out of; *minĕō*, I jut or project: It. *eminente*]: celebrated or conspicuous; rising above others; high in rank, etc.; dignified. EM'INENCE, *-nĕns* [F.—L.]: elevation; height; summit; highest part; high rank; distinction; a hill; title given by Pope Urban VIII., to cardinals in R. Cath. Chh., who had previously been called Most Illustrious and Most Reverend. EM'INENTLY, ad. *-lĭ*, in a high degree. EMINENTIAL, a. *-nĕn'shal*, in *alg.*, term applied to an artificial kind of equation, which contains another eminently.—SYN. of 'eminent': illustrious; distinguished; prominent; lofty; elevated; exalted; remarkable; conspicuous; celebrated; famous; high; lofty.

EMINENT DOMAIN: power of the state to take private property for public use. It cannot, however, be exercised without making compensation to the party whose property has been taken. The right of E D. is an attribute of sovereignty and exists in the American states, even independently of constitutions or statutes. It is to be distinguished from the taking of property by virtue of a war power, or of overruling necessity, or as a condemnation on the ground that the property taken was a nuisance, or in the exercise of police power, or as a forfeiture for the violation of law. In the last named cases, compensation need not be made to the owners. To make the use a public one, it is not necessary that the entire public should share in, or be benefited by a proposed improvement. If a considerable number of the people are interested therein the use is deemed sufficiently public provided it affects a matter concerning the entire community. The exercise of the power of E. D. may be, and usually is, delegated by the state to municipal corporations such as cities, towns, and villages, and to private corporations such as railroads and the like. General laws are provided under which the corporations must act in such cases. An owner of lands sought to be taken, can not be forced to accept anything except money in payment of damages. But benefits conferred upon his remaining

lands by the contemplated improvement may be deducted from the compensation for the land actually taken.

EMIN PASHA (EDWARD SCHNITZER): 1840, Mar.—1893, Feb. 26 (presumably); b. Oppeln, Prussia; explorer. He studied medicine at Berlin, was appointed a surgeon in the Turkish army 1868, and on being sent to Egypt became surg.gen. of the army under Gen. 'Chinese' Gordon. In 1878 he was raised to the post of gov.gen. of the Equatorial Provinces in Africa, with the title of 'Bey.' He reached the seat of his govt. the same year, and found the country in a deplorable condition; but he set to work earnestly, and in the space of three years swept all the slave-traders out of his enormous tract of land, with its 6,000,000 inhabitants. The provinces, which had been governed at an annual expense of $200,000 prior to 1878, were able to send a surplus of $40,000 to the Egyptian govt. 1882, after paying all expenses beside the cost of large public works. On the abandonment of the Soudan by England, E. was left to take care of himself in a territory where slave-traders were all-powerful. In 1882 he was cut off from all communication with the world, chiefly through the hostility of the king of Uganda, and 1886 he appealed for help through Dr. William Junker, Russian explorer. A relief expedition was organized by two wealthy Scotchmen who subscribed $100,000; King Leopold of Belgium summoned Henry M. Stanley from a lecturing tour in the United States to take command; the expedition started 1887, Jan.; and 1888, Apr. 29, Stanley and E. met. E. was strongly opposed to leaving his people, and Stanley waited nearly a year for him to decide whether he would stay in Africa or accompany the relief party to Egypt. 1889, May 8, Stanley and E. started for the coast, and Dec. 4 reached Bagamoyo. In 1890, Apr., E. entered the German service to resume work in Africa. He was murdered by Arabs between Unyoro and Wadelai.

EMIR, n. *ē'mėr* [Ar. *amir*: a commander: Heb. *amar*]: title given in the East, and in n. Africa, to all independent chieftians, also to all the actual or supposed descendants of Mohammed through his daughter Fatima. The latter are very numerous throughout the Turkish dominions, but though entitled by birth to be classed among the first four orders of society, they have no particular privileges or consideration; on the contrary, they are found engaged in all sorts of occupations, and are to be met with among beggars and the lowest of the populace, as frequently as among the mollahs. Their privileges are confined to a few unimportant matters, chiefly to the exclusive right to wear turbans of a green color, that having been the favorite color of the prophet. They are placed under the supervision of the Emir Beshir. In former times, the title of Emir was borne by the leaders in the religious wars of the Mohammedans, as well as by several ruling families, such as the Thaherides and Samanides in Persia, the Tulunides in Egypt, the first seven Ommaiades in Spain. The title Emir, in connection with other words, likewise

designates different offices. *Emir-al-Mumenin*, 'Prince of the Faithful,' is the title assumed by the caliphs themselves. *Emir-al-Muslemin*, signifying the same, was the title of the Almoravides. *Emir-al-Omrah*, 'Prince of Princes,' was the title of the first minister, under the caliphs and the E. Indian Moguls, who united in his own person the highest civil and military dignities. It is now the title of the governors of different provinces. The Turkish master of the horse is styled *Emir-Achor;* the standard-bearer, *Emir-Alem;* and the leader of the caravans of pilgrims to Mecca, *Emir-Hadji*. *Ameer* or *Amere* is another spelling of the same word.

EMISSARY, n. *ĕm'ĭs-sĕr-ĭ* [L. *emissārĭŭs*, an emissary, a spy—from *e*, out of; *missus*, sent: It. *emissario:* F. *émissaire*]: a spy; a secret agent; one sent on private messages.

EMISSION: see under EMIT.

EMIT, v. *ĕ-mĭt'* [L. *emittĕrĕ*, to send out or forth—from *e*, out of; *mitto*, I send: F. *émettre*]: to send forth; to throw or give out; to let fly. EMIT'TING, imp. EMIT'TED, pp. EMISSION, n. *ĕ-mĭsh'ŭn* [L. *e;* *missus*, sent]: the act of sending out; an issuing out; that which is issued.

EMLY, *ĕm'lĭ*: an Irish see, united to Cashel 1568.

EMMANUEL, or EMANUEL, *ĕm-ăn'ū-ĕl*, or IMMANUEL, *ĭm-ăn'ū-ĕl:* Hebrew name employed by the prophet Isaiah, the signification of which—'God with us'—is not by itself proof that the child to whom it was to be given would be divine. But in Matt. i. 23, it is declared that the name had been divinely applied in a special prophetic manner to the child Jesus. The prophecy itself (Is. vii. 14) calls for a fulfilment near at hand, and in accordance with the ordinary laws of nature; the mother of the promised child being unmarried at the time the prophet spake. The birth of such a child in fulfilment of a special promise might be a sufficient sign for a deliverance from national calamity. But as the whole prophecy of Isaiah has supreme reference to a spiritual salvation, the sign of the lower deliverance may have also an ultimate application to the higher; a woman unmarried pointing forward to the virgin mother, and a common child taken as a prophetic emblem of the child Jesus miraculously conceived and born. That this is the true interpretation is argued from (1) the New Testament account of the nativity, the inspired authority of which is established by independent evidence; (2) by the Scripture exhibition of the character and works of Jesus in attestation of His claim to be the Deliverer and Savior who had been prophesied as to be sent forth from God.

EMMAN'UEL COL'LEGE, CAMBRIDGE, England: founded 1584 by Sir Walter Mildmay, chancellor of the exchequer and privy-councilor in the reign of Queen Elizabeth. The foundation fellowships number 13. These are open to all her majesty's subjects, and a candidate

becomes eligible to them on proceeding to the degree B.A. or any equivalent degree. All the foundation fellows are obliged to proceed regularly to the further degree in art, law, medicine, or any other faculty that they have selected. There must be four of them always in priest's orders; and any who are not tutors or bursars in the college, are bound to be in orders at the end of the seventh year of their fellowship, at the risk of forfeiting it three years afterward. The college possesses also two fellowships and four scholarships on Sir Wolstan Dixie's foundation (but the Dixie fellows have no voice in college affairs, nor any claim to the offices or dividends of the college); 21 scholarships (13 of £70 a year, 5 of £30, and 3 minors of £70), paid from the general revenues of the college; five of £30 a year, founded by Dr. Thorpe; and other seven (4 of £35, 2 of £50, and 1 of £16), for which candidates from certain schools have a preferable claim. The patronage of the college consists of 24 benefices, situated in the e. and s.w. counties of England; and of two schools, one in Norfolk, the other in Suffolk.

EMMENAGOGUE, n. *ĕm-mĕn′ă-gŏg* [Gr. *emmēnĭă*, the menses; *ago*, I lead]: medicine which promotes the menstrual discharge—restoring it or bringing it on for the first time. The emmenagogues chiefly in use are preparations of aloes, iron, myrrh, and other stimulants in connection with purgatives; also the local use of the warm bath, leeches, fomentation, etc. See MENSTRUATION.

EM′MERAN, or EMMERAM, SAINT, martyr, bishop of Poitiers: d. 653. His feast is kept on Sept. 22. He converted Bavaria to Christianity. He is the patron saint of Ratisbon.

EMMERICH, *ĕm′mėr-ĭch:* town of Rhenish Prussia, on the right bank of the Rhine, on the borders of Holland. It is very old, and has a Dutch character of cleanliness. It has a custom-house, an orphan house, a gymnasium, and several churches. Emmerich has manufactures of tobacco, chocolate, leather, and liqueurs. Pop. 9,622.

EMMET, n. *ĕm′mĕt* [AS. *æmet*, an emmet—from *æmetta*, leisure, rest: Ger. *ameise*, an emmet—from *emsig*, assiduous, diligent]: an ant: see ANT.

EMMET, *ĕm′ĕt*, ROBERT: 1778–1803, Sep. 20; b. Dublin (some authorities state his birth 1780, Cork): Irish patriot and orator. He was a school-fellow of Thomas Moore, the poet, in Trinity College, from which he was expelled for avowing republican principles 1798, and then joined the assoc. of United Irishmen, who undertook to separate Ireland from Great Britain and establish an independent republic. He became a leader in this movement, and on its failure went to France and planned a general uprising of the Irish people. In 1802 he returned to Dublin, organized his forces, established depots of powder and firearms, and designated 1803, July 23, as the time for seizing the castle and arsenal. On that day the insurgents killed the chief-justice, Lord Kilwarden, and fled at the

first volley from the garrison. Emmet left the city, but returning to bid his betrothed adieu, was arrested, tried, and condemned, and the sentence of death was executed. He defended himself in a speech of remarkable eloquence.

EMMET, Thomas Addis, ll.d., Irish patriot and lawyer: 1764, Apr. 24—1827, Nov. 14; b. Cork: brother of Robert E. He graduated at Trinity College, Dublin, took a medical course in Edinburgh Univ., and his degree 1784, studied law in the Temple, London, and was admitted to the bar in Dublin 1791. In 1798 he was an active member of the assoc. of United Irishmen, was arrested with many associates, and confined in prison nearly 3 years. He was liberated after the treaty of Amiens, but exiled from Ireland. In 1802–3 he lived in Brussels, 1804 came to the United States, and on the advice of Gov. Clinton settled in New York, where he practiced law with signal ability and success, and 1812 became atty.gen. of the state. He published *Pieces of Irish History,* written while in prison in Scotland (New York 1807).

EMMETT, Daniel Decatur, American song writer and negro minstrel: b. Mount Vernon, Ohio, 1815. He served in the army, joined a circus company 1835, and formed the first negro minstrel company 1842, appearing at the old Chatham Theatre, New York, and later in Boston, and in England, where he remained till 1844. He was with Dan Bryant 1854–65, writing the famous song *Dixie* in 1859. He was a most prolific song writer, and among his productions were: *Old Dan Tucker; The Road to Richmond;* and *The Boatman's Dance.*

EMMONS, *ĕm'onz,* George Foster: 1811, Aug. 23—1884, July 2; b. Clarendon, Vt.: naval officer. He entered the U. S. navy as midshipman 1828, became passed midshipman 1831, was commissioned lieut. 1841, commander 1856, capt. 1863, commodore 1868, and rear-admiral 1872, and was retired 1873, Aug. 23. He was attached to Capt. Wilkes's South Sea exploring expedition 1838–42, served on the w. coast of Mexico and in Cal. during the Mexican war, captured Cedar Keys, Fla., and Pass Christian, Miss., with 20 prizes 1862, was fleet-capt. under Dahlgren off Charleston 1863, commanded a division of blockading vessels in the Gulf of Mexico 1864–5 and raised the American flag over Alaska 1868.

EMMONS, Nathanael, d.d.: 1745, May 2—1840, Sep. 23; b. East Haddam, Conn.: Congl. minister and theologian. At the age of 18 he entered Yale College, and was one of the four best scholars of his class. In 1773 he became pastor of the Congl. church in Franklin, Mass., in which office he continued 54 years. The distinctive tenets of Emmon's theological system are: 1. Holiness and sin consist in free, voluntary exercises; 2. Men act freely under the divine agency; 3. The least transgression of the divine law deserves eternal punishment; 4. Right and wrong are founded in the nature of things;

5. God exercises mere grace in pardoning or justifying penitent believers through the atonement of Christ, and mere goodness in rewarding them for their good works; 6. Notwithstanding the total depravity of sinners, God has a right to require them to turn from sin to holiness; 7. Preachers of the gospel ought to exhort sinners to love God, repent of sin, and believe in Christ immediately; 8. Men are active, not passive, in regeneration.'

EMOLLIATE, v. *ĕ-mŏl'lĭ-āt* [L. *emollītus*, made soft—from *e*, out of; *mollĭō*, I soften]: to soften. EMOL'LIATING, imp. EMOL'LIATED, pp. EMOL'LIENT, a. *-ĕnt* [F.—L.]: softening; that which softens or makes supple: N. substance which relaxes or softens; applied in medicine externally, as poultices, and fomentations, and internally as demulcents (q.v.). EMOLLITION, n. *ĕm'ŏ-lĭsh'ŭn*, the act of softening or relaxing. EM'OLLES'CENCE, n. *-lĕs'sĕns*, that degree of softening produced in a body when its shape begins to alter.

EMOLUMENT, n. *ĕ-mŏl'ū-mĕnt* [OF. *emoulment*—from L. *emolŭmĕntum*, a working out, labor—from *e*, out of; *molīrī*, to exert one's self]: profit from an office; advantage; profit; gain. EMOL'UMEN'TAL, a. *-mĕn'tăl*, useful; yielding profit.

EMORY, *ĕm'o-rĭ*, JOHN, D.D.: 1789, Apr. 11—1835, Dec. 17; b. Queen Anne co., Md.: Meth. Episc. bp. He received a collegiate education, studied law and was admitted to the bar 1808, and entered the ministry of the Meth. Episc. Church 1810. With one exception he was a delegate to every general conference of his church between 1816 and 1832, and during this period he represented American Methodism in the British Wesleyan conference 1820, and was appointed book agent and editor in New York 1824. He founded the *Methodist Quarterly Review*, and actively promoted the establishment of the Univ. of New York, Wesleyan Univ., and Dickinson College. He was elected bp. 1832, and beside controversial papers of note, 1817, 28, was author of *The Divinity of Christ Vindicated*, and *Defense of Our Fathers*.

EMORY, ROBERT, American educator: b. Philadelphia, Pa., 1814, July 29; d. Baltimore, Md., 1848, May. He was a son of John Emory (q.v.). He was appointed professor of ancient languages in Dickinson College in 1834; resigned in 1839; and entered the Baltimore Annual Conference of the Methodist Episcopal Church. He was recalled to the college and made president pro tem. in 1842, and president from the retirement of Dr. Durbin till his death. His publications include: *Life of Bishop Emory* (1841); *History of the Discipline of the Methodist Episcopal Church* (1843); and *Analysis of Butler's Analogy*.

EMORY, *ĕm'o-rĭ*, WILLIAM HEMSLEY: 1811, Sep. 9—1887, Dec. 1; b. Queen Anne co., Md.: soldier. He graduated at the U. S. Milit. Acad. 1831, and was appointed lieut. of artil. and mounted rangers; was appointed 1st

lieut. topographical engineers 1838; promoted capt. and brev.maj. 1847; lieut.col. 6th U. S. cav. 1861; brig.gen. vols. 1862; brev.maj.gen. vols. 1864; brev.brig.gen. and brev.maj.gen. U.S.A. 1865; full maj.gen. of vols. 1865, Sep.; and retired as brig.gen. U.S.A. 1876. He was on duty in Charleston harbor during the nullification troubles; was employed on the Del. river improvements and the n.w. boundary survey; was on Gen. Kearny's staff during the Mexican war; ran the boundary between Mexico and the United States under the Gadsden treaty; served with marked distinction through the civil war; and commanded the dept. of W. Va. 1865–66; of Washington 1869–71, and of the Gulf 1871–75. Emory was author of several important works, including: *Notes of a Military Reconnoissance in Missouri and California;* and *Report of the United States Boundary Commission.*

EMORY COLLEGE, an educational institution in Oxford, Ga., founded in 1836 under the auspices of the Methodist Episcopal Church; reported at the close of 1906: Professors and instructors 15; students 296; volumes in the library 30,000.

EMOTION, in psychology. The term emotion has often been used in English philosophy and psychology to designate any condition of mental excitement. It is now-a-days used ordinarily for those states of feeling which are more or less common to all men and for which language provides special terms, such as anger, fear, grief, etc. The terminology is, however, relatively ambiguous. The terms emotion, feeling, mood, and sentiment, are employed in ways which often overlap.

The more familiar emotions, such as fear and anger, are strongly marked by the presence in them of feelings of bodily condition. In fear, for example, the heart beat and the respiration are both distinctly disturbed and occasion in us definite sensations for the most part painful. Two modern psychologists, James and Lange, maintain that our feeling of these bodily reactions which are produced reflexly in us by emotional stimulations constitute the distinguishing feature of emotion as such. If these reflex actions with their consequent sensations and feelings are wanting, emotion itself is absent. For example, we may recognize that a situation is dangerous, but so long as our involuntary muscular activities go on undisturbed, we shall not have the typical feeling which we call fear. On evolutionary grounds the fact that in emotional situations the organism manifests these curious reflex actions, has been connected with the supposed utility which these actions represent, or did represent at an earlier stage of life. Thus, for instance, the curling up of the lip in anger is highly suggestive of the immediate use of the teeth for combat. This type of explanation encounters not a few difficulties, but these are probably due to our ignorance of the conditions of primitive organisms, rather than to any faliacy in the principle itself. See FEELING.

EMPÆSTIC, or EMPESTIC, a. *ĕm-pĕst′ĭk* [Gr. *empaistikē* (*technē*), the art of embossing—from *empaiō*, I stamp in—from *em* or *en*, in; *paiō*, I strike]: term applied to inlaid work, resembling the modern buhl or marquetry; next to Toreutic art (with which it must not be confounded), it was most practiced by the ancients. It consisted in knocking threads or pieces of different metals into another piece; also embossing.

EMPALE, v. *ĕm-pāl′* [F. *empaler*—from *em*, in or on; L. *pālus*, a pole or stake]: to put to death by driving a sharpened stake or pole through the body; to inclose or surround with poles. EMPA′LING, imp. EMPALED′, pp. *-pāld′*. EMPALE′MENT, n. [F.—L.]: putting to death by thrusting a sharpened stake or pole through the body.

EMPAN′NEL, or IMPANNEL, or EMPANEL: see IMPANEL: see also PANEL.

EMPECINADO, *ĕm-pā-thē-nâ′thō*, Don JUAN MARTIN DIAZ, EL: 1775–1825: one of the leaders of the Spanish revolution of 1820. He was the son of poor parents, and entered the Spanish army 1792. At the head of 5,000 or 6,000 men, he carried on a guerilla warfare against the French during the Peninsular struggle, and acquired great distinction. In 1814, he was appointed col. in the regular army, and the king himself created him field-marshal; but in consequence of petitioning Ferdinand, 1815, to reinstitute the Cortes, he was imprisoned, and afterward banished to Valladolid. On the outbreak of the insurrection 1820, he took a prominent part on the side of the constitutionalists, and on several occasions showed great courage, daring, and circumspection. After the triumph of the absolutists 1825, he was arrested, exposed in an iron cage to the contumely of the passers-by, and finally executed on a common gibbet, amid the ferocious yellings of a debased and liberty-hating populace.

EMPEDOCLES, *ĕm-pĕd′o-klēz:* Greek philosopher of Agrigentum, in Sicily; about B.C. 450. So great was the estimation in which he was held by his fellow-citizens as a physician, a friend of the gods, a predicter of futurity, and a sorcerer, or conjurer of nature, that they are said to have offered him the sovereignty. But being an enemy of tyranny, he declined it, and was the means of delivering the community from the dominion of the aristocracy, and bringing in a democracy. There was a tradition that he threw himself into the crater of Etna, in order that his sudden disappearance might beget a belief in his divine origin, this, however, is only a fable, like the story told by Lucian, that Etna in eruption threw out the sandals of the vain philosopher, and thus destroyed the popular belief in his divinity. The statement of Aristotle is, that he died at the age of 60; later writers of less weight extend the period of his life considerably further.

In Empedocles philosophic thought is bound up with poetry and myth even in a higher degree than in Parmenides (q.v.). His general point of view is determined

by the influence of the Eleatic school (q.v.) upon the physical theories of the Ionic philosophers. He assumed four primitive independent substances—air, water, fire, and earth, which he designates often by the mythical names Zeus, Here, etc. These four *elements*, as they were called, kept their place till modern chemistry dislodged them: see ELEMENTS. Together with material elements, he affirmed the existence of two moving and operating powers, love and hate, or friendship and strife, the first as the uniting principle, the second as the separating. The contrast between matter and power, or force, is thus brought out more strongly by Empedocles than by previous philosophers. The origin of the world, or cosmos, he conceived in this way: In the beginning, the elements were held in a sort of blended unity, or *sphere*, by the attractive force of love; when hate, previously exterior, penetrated as a repelling and separating principle. In this process of separation, which gives rise to the individual objects of nature, he seems to have assumed a series of stages, a gradual development of the perfect out of the imperfect, and a periodical return of things to the elemental state, in order to be again separated, and a new world of phenomena formed. From the fragments that we possess of his didactic poem, it is not clear how far he considered fire as the substratum of strife, and water as the substratum of love, and ascribed various creations to the predominance of one or the other of these principles. Of his opinions on special phenomena, may be mentioned his doctrine of emanations, which proceeding from one thing enter into corresponding openings in other things. By this assumption in connection with the maxim, that like is known only by like, he thought to explain the nature of perception by the senses. He attempted to give a moral application to the old doctrine of the transmigration of souls, his views of which resembled those of Pythagoras. The fragments of Empedocles have been edited by Sturz (2 vols. Leip. 1805), Karsten (Amst. 1838), and Stein (Bonn 1852). The text and English translation are given by Arthur Fairbanks, *The First Philosophers of Greece* (Lond. 1898); translation and commentary by John Burnet, *Early Greek Philosophy* (Lond. 1892).

EMPEROR, n. *ĕm′pėr-ėr* [F. *empereur;* OF. *empereor*, an emperor—from L. *impĕrātōrem*, a commander—from *impĕrō*, I command: It. *imperatore*]: a sovereign; a title of dignity higher than a king. EM′PRESS, n. *-prĕs* [OF. *empereis*—from L. *imperātrīcem*]: consort or wife of an emperor.—The original signification of the word *emperor*, which in the modern world has become the highest title of sovereignty, can be understood only when it is taken in conjunction with *imperium*, which in the Roman political system had a peculiar and somewhat technical meaning. The imperium of a magistrate, be he king or consul, was the power which he possessed of bringing physical force into operation for the fulfilment of his behests. This

power was conferred by a *lex curiata*, and it required this authorization to entitle a consul to act as the commander of an army. In the case of the kings also, the imperium was not implied in their election, but was conferred separately, by a separate act of the national will. 'On the death of King Pompilius,' says Cicero, 'the *populus* in the *comitia curiata* elected Tullus Hostilius king, upon the rogation of an *interrex;* and the king, following the example of Pompilius, took the votes of the *populus*, according to their *curiæ, on the question of his imperium.*'—*Republic*, ii. 17. Now, it was in virtue of this imperium that the title imperator was given to its possessor. Far from being an emperor in the modern sense, he might be a consul or a pro-consul; and there were, in fact, many imperatores, even after the title had been assumed as a prenomen by Julius Cæsar. It was this assumption which gradually gave to the title its modern signification. In republican times, it had followed the name, and indicated simply that its possessor was *an* imperator, or one possessed of the imperium; now it preceded it, and signified that he who arrogated it to himself was *the* emperor. In this form it appears on the coins of the successors of Julius. After the times of the Antonines, the title grew into use as expressing the possessor of the sovereignty of the Roman world, in which sense *Princeps* also was frequently employed. In the introduction to the *Institutes*, Justinian, speaking of himself, uses both in the same paragraph. From the emperors of the West, the title passed to Charlemagne, founder of the German empire. When the Carlovingian family expired in the German branch, the imperial crown became elective, and continued to be so till it ceased—Francis II., who 1804 had declared himself hereditary Emperor of Austria, having laid it down 1806. In addition to the Emperor of Austria, there are now in Europe the Emperor of Russia, and German Emperor, the latter of whom, was, 1871, Jan. 18, proclaimed under this title within the Hall of Mirrors, in the palace of the French kings at Versailles, in the presence of the German princes, and the standards of the German army which was beleaguering Paris. In 1876 the Queen of England assumed the title Empress of India, in addition to those which she bore previously.

EM'PEROR MOTH (*Saturnia pavonia minor*): moth of the same family (*Bombycidæ*) with the silkworm moth. The E. M. is the largest British lepidopterous insect. Its expanses of wings is about three and a half inches. Each wing is ornamented with a large eye like glassy and transparent spot. The Peacock Moth (*S. pavonia major*) is the largest European species, and attains an expanse of 5 inches across the wings.

In the United States are similar large moths of this genus. *S. Io.*, female, expands $3\frac{1}{2}$ in.; the fore-wings are purple-brown; in the male, expanding $2\frac{3}{4}$ in., they are Indian yellow; both have on the hind wings a large blue 'eye,' black-bordered and white-centred. The young caterpillars march in ranks, first one, then two, then three, etc.

EMPETRA'CEÆ: see CROWBERRY.

EMPHASIS, n. *ĕm'fă-sĭs* [L. and Gr. *emphăsis*, forcible expression—from *em*, in or on, and Gr. *phĕmĭ*, I speak, I assert]: the stress or force of the voice put upon a particular word or syllable to increase its significance (see ACCENT); impressiveness of expression. EM'PHASIZE, v. *-sīz*, to pronounce certain words with a particular force of the voice. EM'PHASI'ZING, imp. EM'PHASIZED, pp. *-sīzd*. EMPHAT'IC, a. *-făt'ĭk* [Gr. *emphătĭkŏs*]: uttered with emphasis; forcible; strong, also EMPHAT'ICAL, a. *-ĭ kăl*. EMPHAT'ICALLY, ad. *-lĭ*.—SYN. of 'emphatic': impressive; energetic; striking; earnest.

EMPHLYSIS, n. *ĕm'flĭ-sis* [Gr. *em* or *en*, in, upon; *phlusis*, a vesicular tumor, an eruption—from *phluō*, I boil, I bubble up]: in *med.*, vesicular tumor or eruption, proceeding from an internal and febrile affection, including miliary fever, thrush, cowpox, pemphigus, and erysipelas.

EMPHRACTIC, a. *ĕm-frăk'tĭk* [Gr. *em* or *en*, in; *phrassō*, I obstruct, I block up]: in *med.*, having the quality of closing the pores of the skin.

EMPHYSEMA, n. *ĕm'fĭ-sē'mā* [Gr. *emphusĕmă*, inflation—from *em*, in; *phusan*, to blow]: in *med.*, unnatural distention of a part with air. Emphysema of the cellular tissue often takes place in the neighborhood of wounds of the air-passages, and is the consequence of an escape of air from these parts. Emphysema of the lungs is the consequence either of distention or of rupture of the air vesicles, especially on the surface. (See LUNGS, DISEASES OF.) It is rarely that emphysema is produced otherwise than mechanically; but collections of fluid in a state of decomposition sometimes give out gases, which penetrate and distend the tissues with which they are in contact. Air may also collect in the subcutaneous tissues in cases of gangrene, and certain bacteria may cause the formation of gases beneath the skin or in the substance of the internal organs. One of these gas-forming bacilli is called *Bacillus aërogenes capsulatus*. EM'PHYSEM'ATOUS, a. *-sĕm'ă-tŭs*, characterized by the presence of air, or a light puffy humor.

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EMPHYTEUSIS, n. *ĕm'fĭ-tū'sĭs* [L. *emphyteu'sis*, a planting—from Gr. *ĕmphŭteu'ō*, I plant or improve land]: in *law*, grant of land or houses for ever, or for a very long lease, on condition of a fixed annual payment to the proprietor or superior. In Roman law, the emphyteusis much resembled feudal holdings, so much so, indeed, that Craig and other Scotch writers apply the term to them. It is used in the same sense as Eng. *fee* and *fief*, Scotch *feu*. Emphyteutic, a. *em'fi-tū'tĭk*, taken on hire.

EMPIDÆ, n. *ĕm'pĭ-dē* [Gr. *empis*, a mosquito, a gnat—from *eidos*, form]: family of *Diptera*, with short antennæ. They are not really akin to gnats, except that they fly in numbers over water in summer evenings. They are of small size, and live partly on other insects and partly on the juice of flowers. Empis is the type.

EMPIRE, n. *ĕm'pīr* [F. *empire*—from L. *imperĭŭm*, command, power: It. *imperio*]: the dominions of an emperor, usually including several nations or nationalities; dominion; supreme control; governing influence or command: see Emperor.—Syn.: kingdom; dominion; sway; rule; control; reign; sovereignty; state; government; power; realm; commonwealth.

Empire City and Empire State: names applied respectively to New York City and New York State because of their predominant wealth and commerce.

EMPIRIC, n. *ĕm-pĭr'ĭk* [OF. *empirique*, an empiric—from L. *empirĭcus:* L. *empirĭcī;* Gr. *empei'rikoi*, physicians who followed a system based on practical experience alone—from Gr. *em*, in; *peira*, an effort, a trial]: one whose knowledge and practice are founded on experience; one who practices medicine without being regularly educated; a pretender to medical skill; a quack. It is difficult to say at what period, or in what manner, this word began to degenerate from its original meaning. Probably the idea was, that empiricism, or experimental science, excluded the reasoning faculty, because it did not require, or at least was not based on, scientific theory; and, therefore, the profession of empiricism came to be synonymous with vulgar ignorance. The empirics were a regular sect of ancient physicians in the time of Celsus and Galen, who gives us some insight into their modes of thought and practice. They laid great stress on the unprejudiced observation of nature; and thought that, by a careful collection of observed facts forming a history, the coin-

cidence of many observations would lead to unalterable prescriptions for certain cases. The later adherents of the school excluded all theoretical study, even that of anatomy, and were guided solely by tradition and their individual experience. By an empiric in medicine is now understood a man who, from want of theoretic knowledge prescribes remedies by guess according to the name of the disease or to individual symptoms, without thinking of the constitution of the patient or other modifying circumstances. What are called *specifics* are administered on this principle, or want of principle. EMPIR'IC, a. or EMPIR'ICAL, a. *-ĭ-kăl*, gained through, or based upon experience; pertaining to empiricism (q.v.). EMPIR'ICALLY, ad. *-lĭ*, without science; in the manner of a quack. EMPIR'ICAL FORM'ULA, in *chemistry*, mode of expressing the constituents of a compound in symbols, where the total quantity of each element is written down without reference to any particular order or state of combination. Thus, alcohol consists of 4 equivalents of carbon, 6 of hydrogen, and 2 of oxygen; and its empirical formula is $C_2 H_6 O$. When regarded, however, as a member of a family group, the constituents are arranged in a more systematic manner, as in C_2H_5 (OH), representing the theoretical constitution of alcohol, which, strictly speaking, is the hydrated oxide of ethyl. Again, the rational formula of Epsom salts, which is $MgSO_4 + 7H_2O$, represents it theoretically as a hydrated sulphate of magnesia; while the empirical formula $MgH_{14}SO_{11}$ merely tells us that it consists of 1 equivalent of magnesium (Mg), 1 of sulphur (S), 7 equivalents of hydrogen, and 14 equivalents of oxygen. EMPIRICAL LAWS, such as expresses relationships, which may be merely accidental, observed to subsist among phenomena, but which do not suggest or imply the explanation or cause of the production of the phenomena. They are usually tentative, and form stages in the progress of discovery of causal laws. Bode's law of the distances of planets from the sun is an example.

EMPIRICISM: the doctrine that all knowledge is gained through, or based upon, experience.

(1). Empiricism in psychology, maintains that all the contents of consciousness are derived from simple mental elements, their activity, and combination. E.g., our perceptions of space and time are due to the repeated concurrence of simple sensations. Empiricism is opposed to Nativism, which maintains that there is at least an innate predisposition to perceive things in space and time.

(2). In logic and epistemology, Empiricism holds that, since all knowledge is derived from experience, the sole test of truth is verification in experience, i.e., by means of sense perceptions. Empiricism is thus opposed to Rationalism (q.v.), which maintains that we have at least the possibility of ideas prior to experience and that experience merely serves the purpose of evoking, but not creating, them.

Most ancient philosophers held more or less a mixture of the two positions, although the Sophists were pure empiricists in the modern sense, while Plato's and Aristotle's views were much more akin to Rationalism. Nearly all mediaeval philosophers would be classed as rationalists rather than empiricists. Francis Bacon (1620) is perhaps most often regarded as the founder of modern Empiricism, though both he and Locke (1689) retained many rationalistic conceptions. Berkeley (1710) developed Empiricism so far as to insist upon the impossibility of all abstract ideas on the ground that these are not immediately presented in experience. Hume's Empiricism (1739) becomes Skepticism, denying the possibility of any knowledge at all except propositions in mathematics, and immediate matters of sense perception; while with Condillac (1780), who viewed the mind as like a statue, gradually clothed with sensations entering from without, Empiricism becomes Sensationalism. These extreme absurdities were refuted by Kant (1781), who introduced a new view called 'critical Empiricism' or 'Criticism (q.v.). Since Kant's time, extreme Empiricism has been thought untenable, and by Empiricism now is usually meant the attitude of those who regard actual sense experience and concrete scientific observations and experiments as more important tests of truth than purely logical tests, such as consistency and comprehensiveness of thought.

Taking Empiricism in this last sense, among the chief empiricists of the last hundred years may be mentioned, J. S. Mill, W. S. Jevons, Venn, K. Pearson, and L. T. Hobhouse. Auguste Comte and Herbert Spencer may also be reckoned as empiricists, while William James is a 'radical empiricist.'

EMPLEAD, v. *ĕm-plēd'* [*em*, and *plead*]: to prefer a charge against; to indict: see IMPLEAD.

EMPLECTON, or EMPLECTUN, n. *ĕm-plĕk'tŭn* [Gr. *emplektos*, interwoven, *en*, in; *plekō*, I weave, I twine]: kind of masonry having a squared stone face; in the Greek it is represented as solid throughout, and in the Roman having a filling of rubble. One form of Roman emplecton has courses of tiles at intervals.

EMPLOY, v. *ĕm-ploy'* [F. *employer*—from mid. L. *implĭcārĕ*, to employ for some one's profit—from *em*, in or on; L. *plĭcō*, I fold]: to keep busy or at work; to use; to exercise; to engage the services of any one; to apply or devote to an object: N. business; occupation. EMPLOY'ING, imp. EMPLOYED', pp. *-ployd'*. EMPLOY'MENT, n. that which engages the time and attention of any one; occupation. EMPLOY'ER, n. one who engages or keeps in service. EMPLOYÉ, n. *ăng-ploy'ā*, also English form, EMPLOYEE, n. *ĕm-ploy'ē* [F. *employé*]: one who is engaged in any occupation.—SYN. of 'employment': business; vocation; engagement; office; service; agency.

EMPLOYER'S LIABILITY: the relation of the hirer

to the hired, as party in a contract. The hire of services is a contract, by which the work or service of a person is given for a compensation or reward. Out of the contract arises the relation of master and servant, or that of employer and employee. The rule of law is well established, that an implied contract cannot arise, where there is a subsisting express contract, covering the entire subject matter. A contract of hiring, unless for more than one year, need not be in writing. And as between strangers the general rule is, where nothing appears to the contrary, that whenever services are rendered and received, a contract of hiring, or an obligation to pay, will be implied. A contract to do an act that is immoral is void at common law and will not be enforced. Contracts which involve the doing of acts contrary to public policy, are also void and cannot be enforced. One who offers himself for employment in a professional capacity represents himself by implication as possessing: (1) That reasonable degree of learning and skill, which is usually possessed by the professors of the same art or science, and which is rdinarily regarded by the community, and by those conversant with the employment, as necessary to qualify him to engage in such business. (2) That he will use reasonable and ordinary care and diligence in the exercise of his skill and the application of his knowledge, to accomplish the purpose for which he is employed. (3) That he will use his best judgment in the exertion of his skill and the application of his diligence. The skill required is not that of the highest or of the lowest member of his profession, but such as averages with the knowledge and skill usually possessed by a majority of the profession. The fact, however, that a professional man has requested and received no pay for his services, does not exempt him from liability for injuries or damages resulting from his failure to exercise the ordinary care and skill of his profession, but the patient or client must obey the instructions of the surgeon, physician, lawyer, etc. The hiring of artistic and scientific services is governed by the same general principles of law that are applicable to contracts of hire of other services. The law implies a contract on the part of the employee, or person hired, that he will perform the service skilfully, and he will be liable for damages to his employer for a failure to do so. Where mechanical services upon a chattel are the subject of hire, and the chattel is entrusted to the workman, he becomes a bailee of the property to be worked upon, and is liable for ordinary neglect. The relation of the workman to the employer is personal, and grows out of the confidence the employer is presumed to repose in the skill and fidelity of his employee when entrusting his property to him for the service intended to be performed on or toward it. And the law implies a contract on the part of the employee or bailee to perform the service skilfully, and then return the property faithfully on payment for his service.

EMPLOYMENT BUREAUS.

The employee is liable for his negligence or misconduct, whether the damage is done directly to the property of the employer or whether it arises from the reparation which the employer has been compelled to make to third persons to satisfy his liability for the acts of his employee.

The recent disputes between industrial corporations and their employees, frequently leading to strikes which are productive of serious inconvenience and pecuniary loss to the general public, have prompted several states to interfere by legislation in order to control the contract-making power of the employer and the employed. Boycotting unpopular employers or employees, in order to influence the making of contracts, is expressly prohibited by certain states, while, in many more, such a prohibition seems implied by the terms of recent statutes. Fourteen states prohibit the employer from exacting an agreement from any one, as a condition of being employed, that he will not join or become a member of any labor organization. Blacklisting, by which employees are cut off from the opportunity of making a contract and gaining employment is expressly declared unlawful in 21 states, and in eight other states its illegality is implied in recent statutory enactments. The option of the employer to exact by contract more than eight hours' work is taken away by the laws of a majority of the states, and in very many of them eight hours is made to constitute a day's work on public roads, highways and bridges, in state, county and municipal undertakings. This specific legislative interference in the dealings of the employer and the employed has been supplemented by the institution of a permanent board to settle labor disputes, in which the public, organized labor and the employers are represented by delegates.

EMPLOYMENT BUREAUS: establishments, whether private or public, at which those seeking employment are put into communication with those who are offering it. Private employment bureaus are found in every large city, but they are often conducted without judgment, sometimes have been accused of dishonesty; they are in any case mercenary, and their usefulness is at least problematical. Public bureaus, opened by the national or city government, are non-mercenary, and the motive that has prompted their establishment is a sound humanitarian and political motive. Such bureaus have two practical objects. They are a means of communication between employer and employee, labor exchange, as they are called in France. In the second place they do something toward settling the wage question, by giving quotations of the amount offered and asked.

The public governmental employment bureau originated in France. In 1848 one such bureau was established in each of the mairies of Paris. The institution languished, but in 1886 was revived and has since become universal in France. The first employment bureau opened in England was at Egham, near London, in 1885, and the

movement has since been spreading to the larger towns. Switzerland followed suit with a labor bureau at Berne in 1888, and another at Basle in 1889; Germany established one at Freiburg in 1892, and the movement has been taken up enthusiastically by almost every city of importance. The United States has its government employment bureaus also, and Ohio was the pioneer in the movement. Nine states have authorized their establishment by legislative enactment, and although three states have tried and given up the government employment bureau, they are states of the West, where employment is plentiful, and the need of an intermediary is scarcely felt, certainly not as keenly as in the crowded cities of the East.

EMPORIA, *ĕm-pō′rĭ-a:* city, cap. of Lyon co., Kan.; on the Neosho river, 6 m. above its junction with the Cottonwood; on the Mo., Kan. and Tex. railroad 28 m. w.n.w. of Burlington, 61 m. s.e. of Junction City, 61 m. s.s.w. of Topeka. It has a court-house, state normal school, Presb. college, conservatory of music, federal govt. building, Anderson Memorial College, and public libraries, and carries on a large wholesale export trade in the products of flour mills, foundry, and furniture, woolen goods, brooms, soap and carriage factories, and of a farming and stock-raising region. Pop. (1900) 8,223.

EMPORIUM, *ĕm-pōr′ĭ-ŭm* [L. *empōrĭŭm;* Gr. *empŏrĭŏn,* a place of trade, a market-place: It. *emporio*]: a mart or place for sale of goods; a city or town with extensive commerce. The word is from *emporos,* which in later Greek meant a wholesale merchant, as opposed to a retailer who was called *kapēlos.* E. thus came to be applied to the receptacles in which wholesale merchants stowed their goods in seaports and elsewhere, and thence to cities with great warehouses.

EMPOWER, v. *ĕm-pow′r* [*em,* and *power*]: to give authority or power to; to commission or authorize. Empow′ering, imp. *-pow′rĭng.* Empow′ered, pp. *-pow′rd.*

EMPRESS: see under Emperor.

EMPROSTHOTONOS, n. *ĕm-prŏs-thŏt′on-ŏs* [Gr. *emprosthen,* before; *teinō,* I draw]: spasm which bends the body forward and confines it in that position. This sometimes happens with tetanus. *Note.—Emprosthotonia* would be a better term than *Emprosthotonos,* which is properly an adjective.

EMPTION, n. *ĕm′shŭn* [L. *emptĭōnem,* purchase—from *ĕmō,* I buy]: in *law,* the act of buying; a purchase: see Sale of Goods.

EMPTY, a. *ĕm′tĭ* [AS. *æmtig,* vacant, empty—from *æmta,* leisure, rest]: containing nothing except air; void; vacant; unsubstantial; unsatisfactory; without force; senseless; vain; ignorant: V. to make void; to exhaust; to pour out the contents: N. a case or package without its contents. Emp′tying, imp. Emp′tied, pp. *tĭd.* Emp′tiness, n. *-nĕs,* state of containing nothing; voidness;

inability to satisfy desire.—Syn. of 'empty, a.': hollow; destitute; waste; deserted; desolate; unfruitful.

EMPTYSIS, n. *ĕmp'tĭ-sĭs* [Gr. *emptuō*, I spit upon—*em* or *en*, in, upon, and *ptuō*, I spit out or up]: in *med.*, spitting of blood.

EMPYEMA, n. *ĕm'pī-ē'mă* [Gr. *empŭēmă*, a purulent discharge form the lungs—from Gr. *em*, in; *pŭŏn*, pus]: a collection of purulent matter in the pleural cavity, causing pressure of the lung, and often attended by hectic fever: see Pleurisy.

EMPYREAL, a. *ĕm'pĭ-rē'ăl* [Gr. *empŭrŏs*, prepared by fire—from *em*, in or on; *pura*, fire: Sp. *empíreo:* F. *empyrée*]: formed of pure fire or light; pure; vital; pertaining to the purest or highest region of heaven; ethereal. Em'pyre'an, a. *-pĭ-rē'ăn*, same as *empyreal:* N. the highest heaven, the seat of Deity—there being five heavens according to Ptolemy.

EMPYREUMA, n. *ĕm'pĭ-rô'mă* [Gr. *empŭreu'mă*]: the peculiar burned smell and acrid taste of an animal or vegetable substance when burned in a close vessel; the taste and smell are caused by *empyreumatic oil*, which does not exist naturally in the substance, but is formed in its decomposition by heat. Em'pyreumat'ic, a. *-rô-măt'ĭk*, or -mat'ical, a. *-măt'ĭ-kăl*, pertaining to or possessing the taste of burnt animal or vegetable substances.

EMS: river in the n.w. of Germany, rising in Westphalia, at the s. base of the Teutoburger Wald, and flowing first n.w., then n. through the Hanoverian territories. emptying into Dollart Bay, an estuary of the German Ocean, after a course of 250 m. Its chief affluents are the Aa, the Haase, and the Leda. It is navigable for vessels of 100 tons as far as Pappenburg, 25 m. from Dollart Bay. The Ems drains a basin of about 5,000 sq. m. In 1818, it was connected by a canal with the Lippe, and thus with the Rhine, which greatly increased its importance for commerce and navigation.

EMS, *ĕms*, usually called the *Baths of Ems*, to distinguish it from other places of the same name: bathing-place known to the Romans, and celebrated in Germany as early as the 14th c. It is about four m. from Coblenz, near the most picturesque parts of the Rhine, in a beautiful valley in the province of Hessen-Nassau, traversed by the navigable river Lahn, and surrounded by wooded hills. Its warm mineral springs belong to the class containing soda; the only essential difference between the numerous springs is in the temperature varying from 24° to 46° Reaumur, and in the greater or less amount of carbonic acid gas contained. The bathing establishments are luxuriously fitted up, as are also the hotels and private lodging-houses.—Pop. 6,500.

EMU, n. *ē'mū*, or Emeu [Port. *ema*—from an Indian name]. (*Dromaius*—or *Dromecius*—*Novæ Holland'æ*): a large bird, the ostrich of Australia, one of the *Struthi-*

onidæ or *Brevipennes*. It is a native of Australia, and widely diffused over the s. parts of that continent and the adjacent islands. It is by some ornithologists referred to the same genus with the cassowary, but the differences are considerable; the bill being horizontally depressed, while that of the cassowary is laterally compressed, the head feathered, and destitute of bony crest; the throat is nearly naked, and has no pendent wattles; the feet are three-toed as in the cassowary, but the claws are nearly of equal length. The name emu was given by the older voyagers and naturalists to the cassowary, but is now the invariable designation of the Australian bird. The emu is even taller than the cassowary, which it resembles in the general character of its plumage. Its wings are mere rudiments hidden beneath the feathers of the body. Its color is a dull brown, mottled with dingy gray; the young are striped with black. When assailed, it strikes backward and obliquely with its feet, like the cassowary, and it is so powerful that a stroke of its foot is said to be sufficient to break a man's leg. Dogs employed in hunting it are often injured by its kicks, but well-trained dogs run in before it and spring at its neck. It cannot fly, but runs very fleetly. It is timid and peaceful, and trusts altogether to its speed for safety, unless hard pressed. In a wild state, it sometimes occurs in small flocks; but it has now become rare in all the settled parts of Australia. The extinction of the species may perhaps be prevented by its domestication; as its flesh is excellent, and it is very easily domesticated, and breeds readily in that state. It has frequently bred in Britain. The eggs are six or seven in number, dark green; the male performs the principal part of the incubation. The eggs are highly esteemed as food. The skin of the emu contains much oil—six or seven quarts are obtained from a single bird, and on this account it has been much hunted in Australia. The food of the emu consists chiefly of roots, fruits, and herbage. Its only note is a drumming sound, which it frequently emits.

EMULATE, v. *ĕm′ūlāt* [L. *æmŭlātŭs*, rivalry, emulation: It. *emulare*]: to strive to equal or excel; to vie with; to rival. EM′ULATING, imp. EM′ULATED, pp. EM′ULATOR, n. *-tėr*, one who. EM′ULA′TION, n. *-lā′shŭn* [F.—L.]: competition; rivalry; endeavor to equal or excel. EM′ULA′TORY, a. *-lā′tėr-ĭ*, connected with emulation or rivalry. EM′ULOUS, a. *-lŭs*, eagerly desirous of equalling or excelling. EM′ULOUSLY, ad. *-lĭ*. EM′ULATIVE, a. *-lā-tĭv*, rivalling; disposed to competition. EM′ULA′TIVELY, ad. *-lĭ*.—SYN. of 'emulation': ambition; contention; contest; strife.

EMULGENT, a. *ĕ-mŭl′jĕnt* [F. *emulgent*—from L. *emulgen′tem*, draining out—from *e*, out of; *mŭlgĕō*, I milk: It. *emulgere*, to drain]: milking or draining out. EMUL′SION, n. *-shŭn* [F. *émulsion:* L. *emŭlsŭs*, milked out]: a liquid for softening, etc., formed by the mixture of milk and oil; oil or fat diffused throughout another fluid in the form of

minute globules. The term denotes those preparations in pharmacy obtained by triturating certain substances with water, producing a milky white opaque mixture of a gummy consistence, and composed of oily particles floating in mechanical suspension in the mucilaginous liquid. The *true* and *oily* emulsions are those containing true oil, as the emulsion of bitter almonds, obtained by bruising the latter in a mortar with water; and the *false*, or *not oily*, are those where no true oil is suspended, as where camphor, balsams, or resins are rubbed up with the yolk of egg, mucilage, or dilute spirit of wine EMUL'SIVE, a. *-sĭv*, yielding a milk-like substance; softening.

EMULOUS: see under EMULATE.

EMULSIN, *ēmŭl'sĭn*, or SYNAPTASE, *sĭn'ăp-tās:* an active enzyme found in many seeds and especially in the bitter almond, but also in the sweet almond and the cherry. When bitter almonds are bruised, and water added, the E. acts as a ferment on the amygdaline, and decomposes the latter into volatile oil of bitter almonds, prussic acid, grape-sugar, formic acid, and water (see ALMONDS, FIXED OIL OF: ALMONDS, VOLATILE OIL OF). The vegetable albumen of almonds is almost entirely composed of E.; which, when separated, is a white substance, soluble in water, and distinguished by its remarkable power of causing the fermentation of amygdaline.

EMYDIDÆ, n. plu. *ĕm-ĭ-dī'dē* Gr. *ĕmŭs*, water-tortoise|: the fresh-water turtles or mud-tortoises; also EMYS, *ē'mĭs*.

EMYDIUM, n. *ē-mĭd'ĭ-ŭm* Latinized dim. of Gr. *emus*, a water tortoise|: in *zool.*, genus of *Arachnida*, order *Colopoda*, tribe or family *Tardigrada*.

EMYS, *ē'mĭs:* genus of marsh tortoises (popularly called mud-turtles), from which the whole family of marsh tortoises is sometimes called *Emydæ*. The chelonians of this family are numerous, and widely diffused throughout the warmer parts of the world. They differ from land-tortoises more in their habits than in their appearance and structural characters. Their carapace, however, is more flattened, and their feet are more expanded and webbed, so that they swim with great facility. They feed chiefly on animal food, as insects and mollusks, aquatic reptiles, and fishes, some of them even preying upon birds and mammalia, which come within reach. Two or three species of *Emydæ* are natives of the s. of Europe; but there are many species in the United States; among the most common are the Painted Turtle (*Chrysemys picta*) and the Box Turtle (*Cistudo Carolina*). The flesh of *Cistudo europæa* is esteemed for food. This small species, about ten inches long, an inhabitant of lakes, marshes, and muddy places in the s. and e. of Europe, is sometimes kept in ponds, and fattened for the table on lettuce-leaves, bread, etc.

EN, prefix, *ĕn* [F. *en:* L. *in:* Gr. *en:* AS. *em*]: En becomes *em* before *b*, *p*, or *m;* Gr. *en* signifies *in* or *on;* F. *en* comes from the L. *in*, and signifies *in* or *into*. En is often used as a prefix to augment the force of the word, or to intensify its meaning. En, for AS. *em*, signifies to make, to surround; some words are written indifferently with *en* or *in* as the prefix.

ENABLE, v. *ĕn-ā′bl* [*en*, and *able*]: to make able; to supply with power; to furnish with sufficient means or ability; to authorize. Ena′bling, imp. *-blĭng*. Ena′bled, pp. *-bld*.

ENACT, v. *ĕn-ăkt′* [*en*, and *act*]: to make, as a law; to establish by authority; to decree; to pass into a law, as a bill by congress; to act or do. Enac′ting, imp.: Adj. giving legislative sanction to a bill in order to establish it as a law. Enac′ted, pp. Enac′tive, a. *-tĭv*, having power to enact. Enact′ment, n. *-mĕnt*, a measure or bill passed into a law; the passing of it. Enac′tor, n. *-tėr*, one who.

ENALIOSAURIA, n. plu. *ĕn-ā′lĭ-ō-saw′rĭ-ă*, or -sau′rians [Gr. *enalĭŏs*, marine; *sauros*, a lizard]: in *geol.*, a group or order of fossil reptilians, including the ichthyosaurs and plesiosaurs: see Ichthyosaurus: Plesiosaurus.

ENALLAGE, n. *ĕn-ăl′lă-jē* [Gr. *enallăge*, an exchange—from *allassō*, I change]: in *gram.*, a change of words, or a substitution of one gender, case, etc., for another.

ENALLOSTEGA, n. *ĕn-ăl-lo-stē′ga* [Gr. *enallos*, changed, contrary; *stegē*, a roof]: in *zool.*, type of the *Enallostegidæ*, a family of *Rhizopoda*, having simple cells arranged in two alternate series.

ENAMEL, n. *ĕn-ăm′ĕl* [*en*, in; F. *émail;* OF. *esmail*, enamel: It. *smalto;* Ger. *schmelz* (from same root as *smelt*); color produced by melting glass with a metallic oxide]: a kind of fine glass, variously colored, used for covering articles with a fine glossy surface; any hard glossy surface, as of the teeth (see Teeth); that which is enamelled: V. to coat or paint with enamel; to form a glossy substance on. Enam′elling, imp.: N. the act or art of painting with enamel. Enam′elled, pp. *-ĕld:* Adj. covered with enamel; adorned with anything resembling enamel. Enam′eller, n. one who.—Enamel denotes vitrified substances of various composition applied to the surface of metal or pottery. The basis of enamels is generally an easily fusible colorless glass, to which the desired color and degree of opaqueness are imparted by mixtures of metallic oxides, such as those of tin, arsenic, copper or iron; sometimes calcium phosphate is employed to produce a white opaque effect. The glass is usually an easily fusible lead glass, but for cooking vessels an ordinary soda or potash glass mixed with various borates is employed. The powdered enamel is mixed with some binding material, spread over the surface of the metal or other object, such as a brick or tile to which it is to

be applied, and then heated in a furnace. The champ levé enamel made at Limogues consists of a pattern cut on a sheet of copper, the hollows are filled with enamel paste, which is then fused so that it will adhere to the metal. Finally, the surface is ground smooth. In the case of cloisonné work the pattern is outlined by strips of metal fixed to a base and the spaces between the strips are filled with enamel. The early Byzantine work and that of the Chinese is of this kind and the Japanese have applied it to the decoration of porcelain. The enamel used for covering sheet iron for street signs, or for household utensils is applied in a similar way. It usually contains felspar and borax, but its exact consumption differs somewhat in different works. Many articles of enamel have been found which were the work of the ancient Egyptians and in one form or other it has been practiced by every civilized nation since, the general principles, however, being similar in each case.

ENAMOR, v. *ĕn-ăm′ėr* [F. *en*, in; *amour*, love: L. *amor;* It. *amore*, love: Sp. *enamorar;* OF. *enamorer*, It. *innamorare*, to inflame with love]: to charm; to captivate; to inflame with love. ENAM′ORING, imp. ENAM′ORED, pp. *-ėrd.*

ENANTHEMA, n. *ĕn-ăn-thē′ma* [Gr. *en*, in; and *anthēma* (only used in composition)—from *antheō*, I bloom, I flower]: in *med.*, name given to certain eruptions of the mucous membrane.

ENANTIOSIS, n. *ĕn-ăn-tī-ō′sĭs* [Gr. contradiction—from *enantios*, opposite]: in *rhet.*, figure of speech in which that which is meant to be conveyed is stated in its opposite.

ENARËA, *ĕn-â′re-â:* country of Africa s. of Abyssinia, within lat. 7°—9° n., and long. 36°—38° e., but its limits have not been definitely ascertained. It is inhabited by a portion of the Gallas tribes, who, owing to the continued communication which they keep up with Abyssinia, also to the residence of many Mohammedan merchants among them, are much more civilized than the Gallas usually are. Their government is a hereditary and absolute monarchy. The principal rivers of Enarëa are the Gibbe and the Dodesa. Its coffee-plantations are so extensive as to deserve the name of woods; they occur chiefly along the banks of the Gibbe. Enarëa is remarkable for manufactures of ornamented arms, and of cloths with embroidered borders. Besides these, it exports slaves, gold, ivory, civet, and skins, into Abyssinia. The king and a small portion of the population are Mohammedans, and it is said that native Christians have been found here. The capital is Saka, a place of considerable importance, near the river Gibbe.

ENARGITE, n. *ĕn-âr′jīt* [Ger. *enargit*—from Gr. *enargēs*, distinct, visible]: orthorhombic mineral, with metallic lustre; colors gray or iron-black; composition, sulphur, arsenic, copper, antimony, iron, and silver. It is found in N. America, Chili, and elsewhere.

ENARMED, a. *ĕn-ârmd′:* in *heraldry,* having arms, that is, horns, hoofs, etc., of a different color from that of the body.

ENARTHROSIS, n. *ĕn′âr-thrō′sĭs* [Gr. *enarthros,* jointed—from *en,* in; *arthron,* a joint]: in *anat.,* a ball-and-socket joint; the insertion of one bone into another to form a joint. It admits of the most extensive range of motion; it occurs in the hip and shoulder joints: see JOINT.

ENATION, n. *ē-nā′shŭn* [L. *enātus,* grown or sprung up —from *e,* out of; *nātus,* born]: the changes produced by excessive development in various organs of plants; the growth of adventitious lobes.

ENCÆNIA, or ENCENIA, n. *ĕn-sē′nĭ-ă* [Gr. *engkainĭă,* a festival in honor of the dedication of a temple, statue, etc.—from *en,* in; *kainos,* new]: festivals held on the anniversaries of the founding of cities, and the consecration of churches; at *Oxford* and *Cambridge,* ceremonies observed at the anniversary commemorations of founders or benefactors: see COMMEMORATION.

ENCAMP, v. *ĕn-kămp′* [*en,* and *camp*]: to pitch tents or form huts for the usually temporary lodgment of an army or travelling party; to rest for a time, as an army or a company travelling. ENCAMP′ING, imp. ENCAMPED′, pp. *-kămpt′.* ENCAMP′MENT, n. a resting-place, usually temporary, sometimes (for soldiers) permanent, for an army or travelling company. There are *intrenched* camps, where an army is intended to be keept some time, protected against the enemy; *flying* camps, for brief occupation; camps of *position,* bearing relation to the strategy of the commander; and camps of *instruction,* to habituate troops to the duties and fatigues of war.

For the manner in which Roman camps were constructed, see CAMP.

ENCARPUS, n. *ĕn-kâr′pŭs* [Gr. *en,* in, and *karpos,* fruit]: in *arch.,* sculptured ornament consisting of festoons of carved fruit and flowers, suspended between two points. The festoons are of the greatest size in the middle, diminishing gradually toward the points of suspension.

ENCASE, v. *ĕn-kās′* [F. *encaisser,* to pack in a case: *en,* and *case*]: to inclose or hide, as in a case or cover: see INCASE.

ENCAUSTIC, n. *ĕn-kaws-tĭk* [OF. *encaustique,* wrought with fire—from L. *encaustĭcus;* Gr. *engkaustĭcos,* encaustic — from Gr. *en,* in; *kaustĭkos,* caustic—from *kaiō,* I burn]: method of painting with a wax medium by means of heat: ADJ. pertaining to the art of painting on earthenware in which the colors are burned in. ENCAUSTIC PAINTING, painting fixed by fire, practiced by the ancients. As the name implied that fire was used in the execution, some have been led to suppose that encaustic painting was the same as enamel painting; but notices by Pliny and other writers show clearly that it was a species of painting in which the chief ingredient used for uniting and fixing

the colors was wax dissolved by heat. Various attempts have been made in modern times to revive it. After the middle of last century, ingenious attempts to revive it were made in Paris and London, but with only partial and temporary success. Later, it was again taken up in Germany under the patronage of the king of Bavaria, who had a number of important works executed in this way. The colors are ground, and laid on with a vehicle composed principally of wax. Miss Emily Greenland (Mrs. Hooker, of Rottingdean, 1792) had dissolved gum-arabic in water, afterward adding gum-mastic, dissolved by stirring and boiling, and when the mixture had reached the boiling point, she put in the wax. After painting the picture, she passed a thin coating of melted wax over it with a hard brush, and then drew over the surface an iron—for ironing linen—moderately heated. After the picture cooled, it was rubbed with a fine linen cloth. The German method is somewhat similar, but some other ingredients are used; among these, potash with the wax; and in place of an iron being passed over the surface, the wax is brought to the surface by a vessel containing fire being held at a little distance from the picture. Encaustic painting is not likely to come into general use; for neither in brilliancy of color, facility for execution, nor durability is it to be compared with oil painting. ENCAUSTIC TILES, ornamental tiles of earthenware for floorings, extensively used from the 12th to the 15th c., chiefly for churches; revived for general use in modern times with great success. Strictly speaking, the name applies only to tiles with a pattern produced by layers of different-colored clays; but those also may be included that are made of a single color where two or more kinds go to form a pattern. Of course a mosaic can thus be formed with tiles of various forms and various colors. Tiles of one color are made of dried slip—that is, the powder of carefully mixed and prepared clay. These 'dry tiles' are made by placing the colored clay powder in strong steel molds, and subjecting it to a pressure of several hundred tons, by means of a plunger fitting accurately into the mold. A depth of three inches of powder is compressed into a tile one inch in thickness. It is then removed, heated in a hot chamber, fired, and glazed if required.

The figured tiles are made in a different manner. The clay is worked in a moist state, but very stiff, first into square blocks. These are cut into square slices or slabs by passing a wire through them; upon this is put a facing of fine clay of the color of the ground of the pattern—another layer, of a different quality of clay, is sometimes added to the bottom, to prevent warping. It is then placed in a mold, with a plaster-of-Paris slab forming the top, on the under surface of which is the pattern in relief. This slab is pressed down, and thus forms a deep impression of the pattern to be produced in another color. The clay of the requisite color to form the pattern is now poured, semi-fluid, into this depression, and allowed to

flow over the whole face of the tile; then it is set aside until dry enough to have its surface scraped and smoothed on a whirling table. By this means the superfluous clay is removed, and the pattern is brought out clear and well defined, the two colors of clay forming one smooth flat surface. The tile is then dried and fired.

By Malkin's patent process, inlaid as well as plain tiles are now made wholly of dried slip. The pattern is produced by the use of brass plates one-eighth of an inch thick, a separate one for each color. Thus, if it consist of an ornament in red and white on a blue ground, one plate is perforated so as to enable the red portion of the clay powder to be filled in, another is cut for the white portion, and a third for the blue ground. When all are filled up, the tile is pressed in a screw-press and fired.

ENCEINTE, a. *ăng-sāngt'* [F. *enceinte*—from mid. L. *incincta*, a pregnant woman—from L. *in; cinctus*, surrounded, girt]: pregnant: N. properly, fortified wall or rampart, or whole circle of defensive works around any place; though the term is applied also to the fortified area.

ENCEL'ADUS: son of Tartarus and Gæa in Greek mythology; one of the hundred-handed Titans who made war against the Gods, Jupiter slew him with a thunderbolt and buried him under Mount Ætna. The name Enceladus was given to the second satellite of Saturn, discovered by Herschel, 1789, Aug. 28.

ENCEPHALON, n. *ĕn-sĕf'ă-lŏn* or *ĕn-kĕf'-*, or ENCEPH'ALOS, n. *-lŏs* [Gr. *engkĕphălos*, what is in the head, the brain—from *en*, in; *kephălē*, the head]: the brain. ENCEPH'ALA, n. plu. *-lă*, molluscous animals having a distinct head; gasteropoda. ENCEPH'ALOUS, a. *-ă-lŭs*, pertaining to those molluscous animals, as the limpet and periwinkle, which have a distinct head. ENCEPHALIC, a. *ĕn'sĕ-făl'ĭk*, belonging to the head or brain. ENCEPH'ALAL'GIA, n. *-ăl-ăl'jĭ-ă* [Gr. *ălgos*, pain]: a severe or deep-seated pain in the head. EN'CEPHALI'TIS, n. *-sĕf-ă-lī'tĭs*, inflammation of the brain. ENCEPHALOCELE, *ĕn-sĕf'-a-lo sēl*, tumor projecting through the skull, in one of the parts where the bones are incomplete in infancy; it consists of a protrusion of the membranes of the brain, containing a portion of brain itself. The most common situation of such tumors is in the middle line and at the back of the head. Surgical interference is scarcely ever justifiable, and all that can usually be done is to give uniform support to the tumor, and to defend it from injury. ENCEPH'ALOID, a. *-loyd* [Gr. *eidos*, form]: resembling brain substance, designating a certain form of cancer which is of soft consistency. ENCEPHALOTOMY, n. *ĕn-sĕf-ăl-ŏt'o-mĭ* [Gr. *tomē*, a cutting]: in *anat.*, dissection of the brain.

ENCHANT, v. *ĕn-chănt'* [F. *enchanter*, to charm—from L. *incantārĕ*, to sing a magic formula over—from *in*, on; *canto*, I sing—*lit.*, to sing magic formulas over]: to practice sorcery; to subdue by charms or spells; to delight in a high degree; to charm; to fascinate. ENCHANT'ING,

imp. ENCHANT'ED, pp.: ADJ. inhabited by spirits, ghosts, or imaginary beings; subdued by charms; delighted in a high degree. ENCHANT'ER, n. one who. ENCHANT'MENT, n. the use of magic arts or spells; the magic arts themselves; an overpowering or irresistible influence which fascinates or delights. ENCHANT'RESS, n. fem. a woman who charms or fascinates; a sorceress. ENCHANT'INGLY, ad. *-lĭ*—SYN. of 'enchant': to captivate; enrapture; ravish; bewitch; enslave;—of 'enchantment': incantation; spells; necromancy; charms; magic; sorcery; witchcraft.

ENCHASE, v. *ĕn-chās'* [F. *enchasser*, to inchase—from *en*, in; *chassis*, a frame; *châsse*, a reliquary]: to inclose in another body partially, as a jewel in gold; to adorn with embossed or raised work; to adorn any work in metal by figured work. ENCHA'SING, imp.: N. the art of enriching or adorning works in gold, silver, etc. ENCHASED', pp. *-chāst'*.

ENCHELINÆ, n. *ĕng-kĕl-ī'nē*, or ENCHELI'NA, n. *-kĕl-ī'na* [Gr. *engchelus*, an eel]: in *zool.*, sub-family of infusorial animalcules, family *Trichodidæ*. They have no carapace; cilia round the mouth; and the rest of the body naked. ENCHELYS, or ENCHELIS, n. *ĕng'kĕ-lĭs*, typical genus of the sub-family *Enchelinæ*. Four species are known. According to Meyen some of the red and green snow plants described as *Confervæ*, and placed in the genus *Protococcus* are the infusorial animalcules, *Enchelis sanguinea* and *E. pulvisculus*. Others are genuine protococci.

ENCHONDROMA, n. *ĕn'kŏn-drō'mă* [Gr. *en*, in; *chondros*, cartilage]: abnormal cartilaginous growth; tumor somewhat smooth on its surface, occurring mostly in connection with the bones and with some of the glandular structures: see TUMOR.

ENCHORIAL, a. *ĕn-kō'rĭ-ăl* [Gr. *engchōrĭŏs*, of the same country, domestic—from *en*, in; *chōrŏs*, a place]: native; popular—applied to the common writing of the anc. Egyptians, as distinguished from the hieroglyphic: see HIEROGLYPHICS.

ENCINA, or ENZINA, *ĕn-thē'nâ*, JUAN DEL: 1468–1534; founder of the Spanish drama; b. Old Castile. He studied in the Univ. of Salamanca, removed to Madrid, and under the patronage of the Duke of Alva began entertaining his friends with representations of original comedies about 1492. Subsequently he joined the clerical order in Rome, and was appointed 'maestro di capella' to Pope Leo X., and prior of Leon. He published a collection of dramatic and lyrical poems 1496, a farce *Placida e Victoriano* 1514, made a journey to Jerusalem 1519, published *Trabagia ó Via Sacra de Hierusalem* 1521, and after death was buried in Salamanca cathedral.

ENCIPIENT, n. *ĕn-sĭp'ĭ-ĕnt* [L. *en*, in; *capĭō*, I take]: a palatable vehicle, such as bruised coriander-seeds, in which cattle may take a medical preparation.

ENCIRCLE, v. *ĕn-sėr′kl* [*en*, and *circle*]: to inclose with a ring; to embrace; to go round; to surround. ENCIR′CLING, imp. *-klĭng*. ENCIR′CLED, pp. *-kld*.—SYN. of 'encircle': to inclose; encompass; environ; circumscribe; bound; limit; confine.

ENCKE, *ĕnk′kėh*, JOHANN FRANZ, astronomer: 1791, Sep. 23—1865, Sep. 2; b. Hamburg, where his father was a clergyman. After studying at Göttingen, he served during the campaign of 1813–4 in the artillery of the Hanseatic legion, and 1815 in the Prussian army, as lieut. of artillery. On the establishment of peace, he left the service, and became asst., and afterward principal astronomer in the observatory of Seeberg, near Gotha. In 1825, chiefly at the instigation of Bessel, he was called to Berlin as successor to Tralles, in the secretaryship of the Acad. of Sciences, and as director of the observatory. While at Gotha, the astronomical prize offered by Cotta was awarded to Encke by the judges Gauss and Olbers, for his determination of the orbit of the comet of 1680. This led him to solve another problem, which had been proposed with the other—viz., the distance of the sun. The solution, by means of the two transits of Venus 1761 and '69, is published in two separate tracts (*Die Entfernung der Sonne*, Gotha 1822–24). In 1819, he proved that the comet discovered by Pons, 1818, Nov. 26, revolved in the hitherto incredibly short period of about 1,200 days, and had been already observed 1786, 1795, and 1805. It has since borne the name of Encke's comet, and has appeared regularly; the period of its recurrence being 3.29 years, or about $3\frac{3}{10}$ years: see COMET. Encke's researches on this subject are contained in the *Transactions of the Berlin Academy*. In 1830, he undertook to edit the Berlin *Astronomical Almanac*, in which he published a number of astronomical treatises. Three vols. have appeared of *Astronomical Observations at the Berlin Observatory*, begun 1855.

ENCLAVE, n. *ĕn-klāv′*, F. *âng-klâv′* [F. a mortise—from *en*, in; L. *clavis*, a key]: in *geog.*, territory, country, or place which is completely surrounded by the territories of another power; in *her.*, anything represented as let into something else, particularly when the thing so let in is square.

ENCLITIC, a. *ĕn-klĭt′ĭk* [Gr. *engklĭtĭkŏs*, inclined—from *en*, in; *klīnō*, I bend]: inclining or leaning upon: N. a word or particle joined to the end of another, forming one word, as *ne*, in the Latin word *nonne;* in *Greek*, a particle or word that throws the accent back on a former syllable. ENCLIT′ICAL, a. *-ĭ-kăl*, pertaining to. ENCLIT′ICALLY, ad. *-lĭ*.

ENCLOSE, v. *ĕn-klōz′* [F. *enclos*, an inclosure; *en*, and *close*]: to encircle; to surround; to shut in between other things; to cover with a wrapper or envelope. ENCLO′SING, imp. ENCLOSED′, pp. *-klōzd′*. ENCLO′SURE, n. *-zhûr*, the act of inclosing; that which incloses or is inclosed:

that which is contained in an envelope; space inclosed; common land when inclosed and appropriated. ENCLOSURE, or conventual seclusion of nuns who have taken solemn lifetime vows, is guarded very strictly by the laws of the Roman Catholic Church. The Council of Trent forbids nuns to leave their convents, even for a short time, on any account whatever save for a cause specified in the law, or with the approval of the local bishop. And no person from outside, is to be admitted within the *clausura* of a nunnery unless with leave in writing from the bishop or superior. By violation of this rule excommunication is incurred *ipso facto*. These rules, however, apply to regularly cloistered nuns, who take solemn life-vows of detachment from the world: they do not apply to the houses or convents of religious women whose work brings them in contact with the outside world, such as sisters of charity, of mercy, little sisters of the poor, and the like. In such religious institutions the spirit of the Tridentine law governs, not the letter. Also spelled with IN, as INCLOSE (q.v.).

ENCOMIAST, n. *ĕn-kō′mĭ-ăst* [Gr. *engkōmĭŏn;* L. *encōmĭŭm*, praise: Gr. *engkōmĭăstēs*, a praiser]: one who praises another; a panegyrist. ENCO′MIAS′TIC, a. *-ăs′tĭk*, bestowing praise; laudatory; also ENCO′MIAS′TICAL, a. ENCO′MIAS′TICALLY, ad. *-lĭ*. ENCO′MIUM, n. *-mĭ-ŭm*, high praise or commendation; panegyric: ENCO′MIUMS n. plu.—SYN. of 'encomium': eulogy; applause; praise.

ENCORE, int. or n. *âng′kōr* [F. *encore;* OF. *ancore*—from mid. L. *hanc-horam*, this time, another time]: again; once more; a repetition of the same: V. to call for the repetition of a part of a performance. ENCO′RING, imp. ENCORED′, pp. *-kōrd′*.—Encore is not thus used by the French themselves; their cry is *Bis* (twice).

ENCOUNTER, n. *ĕn-kown′tėr* [F. *encontre*, an encounter—from *en*, in; F. *contre*, L. *contra*, against]: a sudden or accidental meeting of two or more persons; a combat; a fight; a battle: V. to meet suddenly or unexpectedly; to meet in opposition or in a hostile manner; to resist and oppose; to fight. ENCOUN′TERING, imp. ENCOUN′TERED, pp. *-tėrd*.—SYN. of 'encounter, n.': attack; contest; conflict; assault; skirmish; interview; meeting.

ENCOURAGE, v. *ĕn-kŭr′āj* [F. *encourager*, to animate —from *en*, in; F. *cœur*, L. *cor*, the heart (see COURAGE)]: to inspire with courage; to increase confidence of success; to embolden; to animate; to support; to cheer. ENCOUR′AGING, imp.: ADJ. exciting courage; inspiring with hope; cheering. ENCOUR′AGED, pp. *-ājd*. ENCOUR′AGEMENT, n. *-āj-mĕnt* [F.]: incitement to action or to practice; that which serves to incite to, or promote, any undertaking; favor; profit; countenance. ENCOUR′AGINGLY, ad. *-lĭ*.—SYN. of 'encourage': to enliven; exhilarate; comfort; console; solace; inspirit; incite; urge; impel; stimulate; instigate; countenance; sanction; promote; strengthen; forward; advance.

ENCRATITES, n. *ĕn′kra-tīts* [Gr. *engkratēs*, holding fast, master of oneself]: in *chh. hist.*, a rigid sect which arose in the 2d c. It was formed by Tatian, an Assyrian, and a follower of Justin Martyr. Agreeing in most respects with the general church, he is nevertheless accused of corrupting the faith by adding to it a mixture of oriental philosophy. He insisted on the essentially evil character of matter, and the consequent necessity of mortifying the body. He lived in celibacy, fasted rigorously, and used water instead of wine in the Lord's Supper. In addition to the name Encratites (Abstainers), he and his followers were called Hydroparastatæ (Water-drinkers), and Apotactatæ (Renouncers).—*Encratites* was also a name assumed in the 4th c. by certain Manicheans (in no way connected with Tatian), to shield them from the penal laws directed against the sect to which they belonged.

ENCRIMSON, v. *ĕn-krĭm′zn* [*en*, to make, and *crimson*]: to give a crimson color to. ENCRIM′SONED, a. *-znd*, having a crimson color.

ENCRINITE, n. *ĕn′krĭ-nīt* [Gr. *en*, in; *krīnon*, a lily]: an extensive and chiefly fossil group of echinoderms, characterized by their long many-jointed stalks, surmounted by lily-shaped bodies or receptacles; the stone-lily. ENCRINAL, a. *ĕn-krī′năl*, or ENCRIN′IC, a. *-krĭn′ĭk*, and EN′CRINIT′IC, a. *-krĭ-nĭt′ĭk*, also ENCRINITAL, relating to or containing encrinites; applied to some carboniferous limestones almost entirely composed of fossil skeletons of encrinites, found in extensive beds in New York, in the Hamilton and Helderberg groups.

ENCRINITES, *ĕn′krĭ-nīts:* the old name for the fossil Crinoidea, a family of Echinodermata (q.v.). The popular name, *Stone Lilies*, is given to the numerous fossil species, from the resemblance to the lily which many of them present when the rays are closed; hence also the name Crinoidea. Crinoids are characterized by having their bodies supported, during the whole or part of their existence, on a longer or shorter jointed calcareous stem. The stem is attached either by the expanded base, or by jointed processes, to the rocky bed of the sea, or perhaps, in some cases, to floating bodies, like barnacles. Occasionally, numerous root like side arms are sent out from the base of the stem to strengthen and support it; and in some species, as in the recent *Pentacrinus*, the column throughout its length is furnished with axillary side-arms. The stem is round or five-sided; in one genus only is it elliptical. It is composed of a number of joints, perforated in the centre, for the passage of a soft portion of the animal, and beautifully sculptured on the articulating surfaces. The body is cup-shaped, and composed of many-sided plates on the under surface, to the centre of which the stalk is attached, while the upper surface is covered with a coriaceous skin, protected by many small plates. On this was situated the mouth, frequently proboscidiformi, and near it was the anal orifice—the

alimentary canal being turned upon itself, as in the Bryozoa. The arms spring from the edges of the cup. They are five in number at their origin, but, with few exceptions, speedily divide and subdivide dichotomously. The arms are composed of articulated calcareous joints, similar to those of the stems. Each joint is furnished with two slender-jointed appendages or cirri, for capturing prey which consisted of mollusca and other small animals. The number of joints in some species is amazing. Dr. Buckland calculated that *Pentacrinus Briareus*, consists of at least 150,000; and 'as each joint,' according to Carpenter, 'was furnished with at least two bundles of muscular fibre—one for its extension, the other for its contraction—we have 300,000 such in the body of a single *Pentacrinus*, an amount of muscular apparatus far exceeding anything that has elsewhere been observed in the animal kingdom.'

Of 8 genera living, 5 are always stalked. *Pentacrinus Caput Medusæ* of permanently stalked E. lives in tropic seas. It is a native of the W. Indian seas.

The family commenced its existence with the earliest sedimentary deposits. 73 genera have been described, containing upward of 300 species, two-thirds of which are found only in Paleozoic rocks. The most ancient E. have nearly all round stems, the few that are five-sided having the articulated surface of the joints simply radiated, and not complexly sculptured as in Pentacrinus, the type of a division of the order which appears first in the Lias. The earlier seas literally swarmed with these animals. 'We may judge,' says Dr. Buckland, 'of the degree to which the individual crinoids multiplied among the first inhabitants of the sea, from the countless myriads of their petrified remains which fill so many limestone beds of the older formations, and compose vast strata of entrochal marble, extending over large tracts of country in n. Europe and N. America. The substance of this marble is often almost as entirely made up of the petrified bones of Encrinites, as a corn-rick is composed of straws.' See CRINOIDS: PENTACRINUS.

ENCRINURUS, n. *ĕn-krī-nūr′ŭs:* in *paleon.*, typical genus of *Encrinuridæ*, family of Trilobites, occurring in the Upper and Middle Silurians.

ENCROACH, v. *ĕn-krōch′* [F. *en*, in; *accrocher*, to hook on to—from *croc*, a hook]: to invade rights or possessions of another, to take possession of what belongs to another gradually or by stealth; to pass proper bounds; to intrude. ENCROACH′ING, imp.: ADJ. tending or apt to encroach. ENCROACHED′, pp. *-krōcht′*. ENCROACH′ER, n. one who. ENCROACH′INGLY, ad. *-lĭ*. ENCROACH′MENT, n. the seizing stealthily a part of the rights or possessions of another; unlawful advance upon the rights of another; invasion, inroad.—SYN. of 'encroach': to invade; infringe; trespass.

ENCRUST: see INCRUST.

ENCUMBER, v. *ĕn-kŭm′bĕr* [F. *encombrer*, to hinder,

to perplex—from mid. L. *cumbra*, a heap: Dut. *komber*, loss, difficulty: Ger. *kummer*, trouble, rubbish]: to burden with a load; to clog or impede motion with a load; to perplex or embarass; to load an estate with debt. ENCUM'BERING, imp. ENCUM'BERED, pp. *bĕrd*, impeded; loaded with debts, as an estate. ENCUMBERED (or INCUMBERED) ESTATES COURTS, in Britain: see IRELAND. ENCUM'BRANCE (or INCUMBRANCE), n. *-brăns*, anything that impedes motion; load; hinderance; impediment; claim on an estate, as for money or service: see HERITABLE SECURITY: MORTGAGE: LIEN: IRELAND (*Encumbered Estates Courts*). ENCUM'BRANCER, n. *-brăn-sĕr*, one who holds an encumbrance on an estate.—SYN. of 'encumbrance': burden; clog; obstruction; check;—of 'encumber': to press; overload; embarrass; hinder; perplex; clog.

ENCYCLICAL, a. *ĕn-sĭk'lĭ-kăl*, or ENCYC'LIC, a. *-lĭk* [Gr. *engkŭklĭŏs*, circular—from *en*, in; *kuklos*, a circle: F. *encyclique*]: sent to many persons or places; intended for many, as a letter sent individually to a whole order of men; applied anciently to a letter from a church to other churches generally; and later, to the letter of a primate to his suffragan bishops; but now applied specifically to the letter or circular which, on any important occasion, the Pope addresses to all the bishops of the Rom. Cath. Church throughout the world who are in communion with him. This letter usually contains injunctions and warnings against dangers which may threaten the Church, condemns errors prevalent in the world, or explains the line of conduct which Christians ought to take in reference to practical questions pertaining to faith and morals. In 1864 Pius IX. issued an encyclical accompanied by a syllabus in which he condemned eighty alleged errors in religion and civilization. Leo XIII. issued a large number of encyclicals on such questions as, rights of labor, education, marriage, Bible study, etc. (See LEO XIII.) An encyclical differs from a bull or brief, in that the encyclical is to the bishops of the whole world, treats of matter of universal interest, and is of concern to the entire Church. A bull or brief is determined by circumstances, is of a special nature, and may be of particular value only to some locality. There is a difference in the form of an encyclical from that of a bull or brief,—that is, in the seals used, the signatures and the introductory words. ENCYCLICA, n. *ĕn-sĭk'lĭ-kă*, a letter or circular addressed by the pope to bishops on any important occasion.

ENCYCLOPEDIA, n. or ENCYCLOPÆDIA, *ĕn-sī'klō-pē-di-ă*, also CYCLOPEDIA, or CYCLOPÆDIA [F. *encyclopédie*—from Gr. *engkŭk'lŏpaideiă*—from Gr. *en*, in; *kuklos*, a circle; *paideia*, instruction]: a circle of instruction; an alphabetical summary of knowledge. ENCY'CLOPE'DIAN, a. *-pē'dĭ-ăn*, embracing the whole circle of learning. ENCY'CLOPE'DIC, a. *-pē'dĭk*, pertaining to; also ENCY'CLOPE'DICAL, a. *-pē'dĭ-kăl*. ENCY'CLOPE'DISM, n. *-pē'dĭzm*, the state of being encyclopedic. ENCY'CLOPE'DIST, n. one who compiles, or assists in compiling, an encyclopedia.—*Encyclopedia* means properly a book or work professing to give informa-

tion, more or less full, on the whole circle of human knowledge. The Greek words from which it was compounded were used by the Greeks and Romans to signify the circle of instruction through which every free-born youth had to pass before entering public life. That circle embraced particularly grammar, music, geometry, astronomy, and gymnastics, and afterward became the 'seven liberal arts' of the middle ages. The compound name Encyclopedia appears to have been unknown to the Greeks, also to the Latin writers of the classic period; and there is no evidence that either Greeks or Romans ever applied the words, single or compounded, to designate a book. The short form *Cyclopedia* is more remote from classical authority than Encyclopedia. At a later period the word was applied to every systematic view, either of the whole extent of human knowledge or of particular departments of it. The want of such general surveys was early felt; and as knowledge increased they became still more desirable, partly for the purpose of having a systematic arrangement of the sciences in their mutual relations, partly for the readier finding of particular subjects. Attempts to produce books of this nature were made at an early date but the name *Encyclopedia* was not applied to them until the 16th century.

Encyclopedias, in the modern sense of the word, are usually alphabetical; but sometimes the arrangement is 'rational,' i.e., according to the natural relations of the subjects. An alphabetical Encyclopedia is a Dictionary of Universal Knowledge. Besides this, its proper meaning, the name Encyclopedia is often applied—less properly perhaps—to alphabetical works whose scope is limited to a particular branch—works differing in no respect from Dictionaries, Gazetteers, etc.: see DICTIONARY. As all works of this kind, now a large and increasing section of literature in every language, have so far a common character with Encyclopedias proper, some account of the whole class may here be given.

They may be arranged in three divisions: 1. The earlier works of this kind, having, for the most part, merely an encyclopedic character, i.e., embracing a large range of subjects, without distinctly aiming at universality; 2. Encyclopedias proper, which treat of the whole circle of human knowledge; 3. Books professedly confined to a definite department of knowledge, whether under the name of encyclopedia, dictionary, gazetteer, or other title. As books of this class profess to touch on every important point that comes within their scope, they may be considered as encyclopedic in a limited sense. In the following sketch, the somewhat indeterminate distinction between the first and second of these classes, is not strictly adhered to when it would interfere with the chronological sequence.

1. The earliest work of an encyclopedic character is generally ascribed to Speusippus, disciple of Plato. The great collections of Varro (*Rerum Humanarum et Divinarum Antiquitates* and *Disciplinarum libri* ix.), of the elder Pliny

(*Historia Naturalis*), of Stobæus, of Suidas, of Isidorus (the *Origines*), and of Capella, belong to the same class, but they exhibit no plan, and are only confused accumulations of treatises of the then known arts and sciences. Vincent of Beauvais (1264) surpassed them all. He gathered together with wonderful diligence the entire knowledge of the middle ages in three comprehensive works, *Speculum Historiale*, *Speculum Naturale*, and *Speculum Doctrinale*, to which soon afterward an unknown hand added *Speculum Morale*. But these, as well as the similar compilations in the later mediæval period under the title of *Summa*, or *Speculum* (Mirror), are marked throughout by a lack of philosophic spirit. Perhaps the nearest approach to the modern encyclopedia by an ancient writer, dates two centuries earlier than the time of Beauvais. In the 10th c. lived Alfarabius, the ornament of the school of Bagdad, who wrote an encyclopedic collection of knowledge, remarkable for grasp and completeness, still in MS. in the Escorial of Spain. Among the earliest and most noted of modern encyclopedias was that of Johann Heinrich Alsted, or Alstedius, which appeared in Germany, 2 vols. 1630. It consisted of 35 books, of which the first four contained an explanation of the nature of the rest. Then followed six on philology, ten on speculative, and four on practical philosophy; three on theology, jurisprudence, and medicine; three on the mechanical arts; and five on history, chronology, and miscellaneous topics. Two important French works belong to this century—the one is Louis Moreri's *Grand Dictionnaire Historique et Critique*, of which the first edition appeared at Paris 1673, and the last 1759; the other, Peter Bayle's famous *Dictionnaire Historique et Critique*, 4 vols. Rotterdam 1697. The first encyclopedic *dictionary*, so far as known, appeared in Germany as the *Lexicon Universale* of Hoffmann, 2 vols. Basel 1677. Some time afterward appeared in France Thomas Corneille's *Dictionnaire des Arts et des Sciences*, 2 vols. (Paris 1694). Dictionaries limited to the explanation of technical terms had long been common throughout Europe; but previous to Hoffmann's work, no attempt had been made to bring the whole body of science and art under the lexicographic form. A highly successful attempt identical in kind, and attributable in idea, it may be, to the German work just alluded to, was the *Lexicon Technicum* of Dr. Harris, 2 vols. folio (London 1710), which may fairly be regarded as the parent of all the dictionaries of arts and sciences since in England. The *Cyclopædia* of Ephraim Chambers, published 1728, two very large folio vols., presents the next marked advance in the construction of encyclopedical dictionaries. This was brought out with considerable claims to originality of arrangement. The author endeavored to communicate to his alphabetical materials something of the interest of a 'continuous discourse,' by an elaborate system of cross-references. Another peculiarity was, that its author, in the details of mathematical and physical science, gave only conclusions and not processes of demonstration. It was long a very popular work. The

largest and most comprehensive of the successors to Hoffmann's book in Germany was Zedler's *Universal Lexicon*, 64 vols. (Leip. 1732–50). In point of comprehensiveness, this work should be classed with the encyclopedias proper, there being almost nothing then known that may not be found in it. Perhaps the strongest impulse, if not in all respects the best, communicated by the successful attempt of Ephraim Chambers, was given to the French mind through D'Alembert and Diderot. Their *Encyclopédie* was really, though not professedly, founded upon E. Chambers's book, which an Englishman named Mills had translated 1743–45, though the French version of it never was published. The great French *Encyclopédie* was written by various authors of high literary and philosophical attainments, but of whom nearly all were tainted with the most impracticable revolutionary ideas, besides holding for the most part extremely sceptical opinions. The *Encyclopedists* excluded both biography and history from its scope, yet infused into it more originality, depth, and ability than ever had appeared before within the boards of an encyclopedical dictionary. It appeared at Paris in 28 vols. 1751–72, and was followed by a supplement in five vols. (Amst. 1776–7), and an analytical index in two vols. (Paris 1780). The work was everywhere received with great enthusiasm, and it secured a place in the literary history of the nation for the editors and principal writers, who are ordinarily known as the *Encyclopédistes* of France. They were D'Alembert and Diderot the editors, Rousseau, Grimm, Dumarsais, Voltaire, Baron d'Holbach, and Jancourt. [See La Porte's *Esprit de l'Encyclopédie* (Paris 1768); and Voltaire's *Questions sur l'Encyclopédie* (Paris 1770).] D'Alembert's celebrated preliminary discourse was garbled in various pretentious works of this class published mostly in England; such were Barrow's *New and Universal Dictionary of Arts and Sciences*, 1 vol. folio 1751; and the *Complete Dictionary of Arts and Sciences*, by Croker, Williams, and Clerk, 3 vols. folio 1766. A somewhat better, though rather illogical performance was published by a 'Society of Gentlemen,' 1754 in four 8vo vols., generally known as *Owen's Dictionary*, from the name of its publisher. The first rude outline of the ponderous and solid *Encyclopædia Britannica* was laid down in 1771, in three vols., but it was nothing more than a dictionary of arts and sciences; it had not attained to its subsequent universality.

2. The first encyclopedia proper that demands attention is the *Encyclopædia Britannica*, of which the 2d comparatively complete edition, containing biographical and historical articles, appeared in 10 vols. 1776–83; the 3d ed. was completed in 18 vols. 1797; the 4th ed., 20 vols., 1810; the 5th and 6th editions, and supplements, in 6 vols., appeared 1815–24; the 7th ed. 21 vols., 1830–42; the 8th ed. 21 vols, 1852–60; and the 9th ed., 24 vols., 1875–88. The method pursued by this work, while thoroughly alphabetical, consists in a combination of the systematic and the particular. In few instances is any science broken up

into fractional parts; nearly all the sciences are given in treatises as they severally occur in the order of the alphabet. In some cases, however, where obscurity might result from such a plan, the other method is adopted. A marked feature of this work, is the number of complete treatises and dissertations by men of European fame. From first to last, this encyclopedia has been executed and published in Edinburgh, the literary reputation of which it has helped in no small degree to increase. The next encyclopedia to be noticed is the *Encyclopédie Méthodique par Ordre des Matières*, begun 1782, and not finished till 1832. It extends to 166½ vols. of text, with 51 'parties,' containing 6,439 plates. Each subject is treated in a separate vol. or series of vols., so that the work is a collection of separate dictionaries, more extensive than any encyclopedic work that has yet appeared. A work of higher scientific value, however, and of even more varied nature, has been in progress for nearly half a century in Germany, undertaken originally by Professors Ersch and and Gruber 1818, and which has since continued to appear, in three several sections of the alphabet, till the present time. There have already appeared of this great *Allgemeine Encyclopädie der Wissenschaften und Künste* some 150 vols. In 1802, Dr. Abraham Rees projected an extended and improved edition of Ephraim Chambers's *Cyclopædia*, which was completed in 45 vols., 1819. The system of cross-references peculiar to E. Chambers is very effectually carried out in this book; but besides including a great accession of historical and biographical detail, it contained a large number of papers, prepared by competent writers, on subjects with which their study and work had rendered them familiar. Another work of considerable merit, which began to appear 1810, was Brewster's *Edinburgh Encyclopædia* edited by the late Sir David Brewster, and completed in 18 vols. 1830. In 1812, a great impetus was given to encyclopedic publications by the appearance of the *Conversations Lexikon* of F. A. Brockhaus of Leipsic. The 13th ed. (15 vols.) appeared 1882–87; the 14th (illustrated ed.) began to appear 1894. (Meyer's and Pierer's *Conversations-Lexika* also are standard German works.) Brockhaus's has been translated into nearly all the civilized languages of Europe, no fewer than four English works of the kind being professedly founded on it: The *Encyclopædia Americana* (14 vols. 1829–46); the *New American Cyclopædia* (16 vols. New York, 1858–63), of which a new ed. under the title *American Cyclopædia* appeared 1873–76; the *Popular Encyclopædia* (6 vols. Glas., new ed. 1883); and *Chambers's Encyclopædia* (10 vols. Edin. 1860–68; revised ed. 1874–86; new revised ed. completed in 1892): the last is a substantially new work, following in its construction the admirable plan of the *Conversations-Lexikon*, but making use of its valuable matter only so far as it is found suitable. This work has found great popular favor, and has been republished in various forms (some with large additions) in the United States.

The next encyclopedic work after the *Conversations-Lexi*

kon, was one projected according to an original philosophic plan by Samuel Taylor Coleridge, 1818, and finished 1845, in 30 vols. This *Encyclopædia Metropolitana* was arranged in four divisions: 1st, the pure sciences; 2d, the mixed and applied sciences; 3d, biography and history; and 4th, miscellaneous (strangely including geographical) and lexicographic articles. The contributions to the first two divisions were written by persons of recognized ability, and they have nearly all been published separately in 8vo vols. since the *Metropolitana* appeared. If the book had any fault, it was that the plan of it was too rigidly philosophical, and therefore not adapted to be consulted in dictionary fashion; for though in one sense the alphabetic arrangement, by its jumble of subjects, is most heterogeneous and irrational, it recommends itself to popular acceptance by its extreme simplicity; and in point of fact, no encyclopedia has ever been thoroughly popular that has not been executed on the plan of a single alphabet, in which all subjects, however various, are included. Next appeared the *Penny Cyclopædia* of the Soc. for the Diffusion of Useful Knowledge, begun 1833, completed 1843, 28 vols. This work was perhaps, at the time it appeared, the most useful and convenient, for general consultation, of any encyclopedical treatise that had ever been issued. The *English Cyclopædia* is founded on the copyright of the *Penny Cyclopædia*, but is rearranged in four great divisions, each given in the order of the alphabet, viz , geography, natural history, biography, and arts and sciences. This publication was begun 1853, and completed 1861 in 22 vols.; a synoptical index appeared 1862, and a supplementary vol. for each division has since been issued (1869–73). Among other publications of this character which have appeared in the present century, are Wilkes's *Encyclopædia Londonensis*, 24 vols. 4to (Lond. 1810–29); *Encyclopædia Perthensis*, 23 vols. (Edinburgh 1816); and *London Encyclopædia*, 22 vols. (Lond. 1829). The French have published an *Encyclopédie des Gens du Monde*, 22 vols. 8vo (Par. 1833–44); *Encyclopédie Moderne* (42 vols. 1846–62); *Dictionnaire de la Conversation et de la Lecture* (16 vols. 1854–57); and the *Grande Dictionnaire Universel du XIX^e^ Siècle*, edited by Larousse, is one of the most important of modern encyclopedic works. The most notable of the German encyclopedias resembling that of Brockhaus, are Meyer's *Conversations-Lexicon*, 15 vols. (1857; 3d ed. 1874–78, with 6 supplemental vols. 1878–84; 4th ed. 1885, etc.); and Pierer's *Universal Lexicon*, 34 vols. (Altenburg, 1840–46; 6th ed., 1875, etc.). In addition are several European encyclopedias, based upon the *Conversations-Lexicon*—such as the *Enciclopedia Española* (Madrid); the *Nuova Enciclopedia Popolare Italiana* (Turin); the *Nordisk Conversations-Lexicon*, 5 vols. (Copenhagen, 1858–63); and the *Svenskt Konversations-Lexikon*, 4 vols. (Stockholm, 1845–51); besides others in Russia, Hungary, the Netherlands, etc.

3. Different in kind are those books that are *dictionaries* or encyclopedias for one branch of knowledge only. Such are the great *Dictionary of National Biography*, edited by

Leslie Stephen, 63 vols. with supp. 3 v. and index (1885–1903); the *Biographie Universelle* (commenced 1811; new ed. 1842–65); Chalmers's *Biographical Dictionary*, 32 vols. (1812–17); the *Dictionnaire des Sciences Médicales*, 60 vols. (Par. 1812–22); *Nouveau Dictionaire d'Histoire Naturelle*, 36 vols. (Par. 1816–19); F. Cuvier's *Dictionnaire des Sciences Naturelles*, 60 vols. text, 10 vols. plates (1816–45); *Dictionnaire de l'Industrie*, etc., 10 vols. (Par. 1834–41); M'Culloch's *Commercial Dictionary* (1832; last ed., 1882); M'Culloch's *Geographical Dictionary* (1st ed. 1841; new ed. 1866); *Dictionary of Practical Medicine* (Lond. 1866); Chambers's *Cyclopædia of English Literature* (1843; 3d ed. 1876); Spon's *Dictionary of Engineering* (1869–74); Johnston's *Gazetteer* (1850; new ed. 1877); Morton's *Cyclopædia of Agriculture*, 2 vols. (1855); *Nouvelle Biographie Générale* (1855–66); Lippincott's *Gazetteer of the United States* (Philadelphia, last ed. 1906); 'Allibone's *Dictionary of British and American Authors* (Philadelphia, 1859–71); Ure's *Dictionary of Arts, Manufactures, and Mines* (1839; 7th ed., supp. vol. 1877); Schmid's *Encyclopædia des Erziehungs und Unterrichtswesen* (1859–75). Also should be noted the dictionaries of Dr. William Smith, viz., *Dictionary of Greek and Roman Biography and Mythology*, 3 vols. (1843–48; new ed. 1849–51); *Dictionary of Greek and Roman Antiquities*, 2d ed. (1849); *Dictionary of Greek and Roman Geography*, 2 vols. (1854–57); *Dictionary of the Bible*, 3 vols. (1860–63); and *Dictionary of Christian Antiquities* (1875–80); *Dictionary of Christian Biography* (4 vols.). The greatest theological E. is *McClintock and Strong's Cyclopædia of Biblical, Theological, and Ecclesiastical Literature* (10 vols. 1877–1881); and the chief foreign work is Herzog's *Realencyklopadie der Theologischen Wissenschaften* (20 vols.), translated into English, ably re-edited, and pub. (with additions) as the *Schaff-Herzog Encyc. of Relig. Knowledge.*

Since the commencement of the twentieth century, there has been great activity along encyclopedic lines in many countries, notably: Germany, France, Great Britain and the United States. In the United States, the leading modern works are: *The Americana* (16 vols.), edited by Fredk. Converse Beach; and the present work with its combination of encyclopedia and dictionary.

ENCYCLOPE'DISTS: see ENCYCLOPEDIA.

END, n. *ĕnd* [Goth. *andeis;* Skr. *anta*, end, death: AS. *ende*]: the extreme point; the extremity or last part; the conclusion or close; last or ultimate state; limit; close of life; issue or result; object aimed at, as end in view: V. to finish; to terminate; to conclude; to destroy; to be finished; to cease. END'ING, imp. N. termination; conclusion. END'ED, pp. END'LESS, a. without end; interminable; unlimited; perpetual. END'LESSLY, ad. *-lĭ.* END'LESSNESS, n. THE ENDS OF THE EARTH, the remotest parts. END ALL, a

complete termination. END'WISE, ad. *-wīz* [erroneously *endways*]: on end; erectly; with the end forward. END'-MOST, a. remotest; at the extreme end. END-BULBS, n. in *anat.*, bulbous swellings, constituting the termination of some sensory nerves. END-PLATES, n. in *anat.*, expansions terminating the nerves of voluntary muscles. END-SHAKE, n. a certain freedom of endwise motion of a spindle or arbor, which has bearings at each end, so that the shoulders of the gudgeons or pivots (as in a watch), shall not bear against the journal-boxes or plate. END-STONE, n. one of the plates of a watch-jewel against which the pivot abuts. ON END, upright or erect with its whole length. TO PUT AN END TO, to settle; to finish; to destroy completely.—SYN. of 'end, n.': close; finish; last; conclusion; termination; extremity; finality; effect; issue; result; consequence; extermination; object; purpose; aim; drift; remnant; fragment;—of 'endless': eternal; everlasting; infinite; perpetual, incessant; continual; uninterrupted.

END, in Ethics: see ETHICS.

ENDANGER, v. *ĕn-dān'jėr* [*en*, and *danger*]: to put in hazard; to peril; to expose to injury or loss. ENDAN'GERING, imp. ENDAN'GERED, pp. *-jėrd.*

ENDEAR, v. *ĕn-dēr'* [*en*, to make, and *dear*]: to make dear; to make more beloved. ENDEAR'ING, imp.: ADJ. having a tendency to make dear or beloved. ENDEARED', pp. *-dērd'*: ADJ. made beloved or more beloved. ENDEAR'MENT, n. state of being beloved; the cause of love; that which endears; tenderness; affection: N. PLU. caresses.

ENDEAVOR, v. *ĕn-dĕv'ėr* [F. *en devoir*, in duty—from *en*, in; *devoir*, to owe, to be bound; *devoire*, indeavor]: to make it our duty to do a thing; to exert strength either of body or mind for the accomplishment of a purpose; to attempt; to try: N. an exertion of strength, physical or mental, toward some end; effort; an attempt. *I shall do my endeavor*, implying *duty*, means, *I shall make an effort.* ENDEAV'ORING, imp. ENDEAV'ORED, pp. *-ėrd.*—SYN. of 'endeavor, v.': to essay; struggle; strive; aim; exert.

ENDECAGON, n. *ĕn-dĕk'ă gŏn* [Gr. *hendĕkă*, eleven; *gōnĭă*, an angle]: a plane figure having eleven sides and eleven angles.

ENDECAGYNOUS, a. *ĕn-dĕk-aj'ĭn-ŭs* [Gr. *hendeka*, eleven, and *gunē*, woman]: in *bot.*, having eleven petals.

ENDEICTIC, a. *ĕn-dīk'tĭk* [Gr. *endeiktikos*, demonstrating—from *endeiknumi*, to show]: showing; exhibiting; displaying; as, an *endeictic* dialogue, one that displays skill.

ENDEIXIS, n. *ĕn-dīks'ĭs* [Gr. *endeiknumi*, to show]: in *med.*, a showing, displaying, or exhibiting; applied to such symptoms or appearances in a disease as point to the proper remedies to be applied.

ENDELLIONITE; see BOURNONITE.

ENDEMIC, a. *ĕn-dĕm'ĭk*, or ENDEM'ICAL, a. *-ĭ-kăl* [F. *endémique*—from Gr. *endēmĭŏs*—from *en*, on; *dēmŏs*, people]: peculiar to a district or to a certain class of persons —applied to a disease more or less constantly present in a place. N. a disease prevailing in a particular locality or among a particular class of persons. ENDEMICALLY, ad. *-lĭ.—Endemic* is applied to diseases which affect numbers of people simultaneously, but so as to show a connection with localities as well as with their inhabitants. Endemic diseases are usually spoken of as distinguished from epidemic (q.v.) and sporadic (q.v.); the first term indicating that a disease infests habitually the population within certain geographical limits, while a disease is termed epidemic if it is transmitted without reference to locality; and sporadic if it occurs in isolated instances only. When a disease prevails more or less universally throughout the world, as influenza does at times, it is called pandemic. The theory of endemic diseases is, that they are in some way or other connected with the soil, with the habits of the people or with the presence of certain insects which may convey the germs of the disease from the sick to the well. Endemic diseases may in consequence of certain conditions of human travel and intercourse pass beyond their usual limits and exist for a time in epidemic form elsewhere. Thus Asiatic cholera, which is endemic in certain parts of India, occasionally invades other parts of the world in the form of extensive epidemics. An endemic disease is subject to exacerbations at times, even when it does not extend beyond its usual limits.

ENDER, *ĕn'dėr*, EDUARD, Austrian artist: b. Vienna 1824. A son and pupil of Johann Ender (q.v.), he studied at the Vienna Academy, becoming a historical and genre painter.

ENDER, JOHANN, Austrian artist: b. Vienna 1793, Nov. 4; d. 1854, Mar. 16. As a portrait painter he was successful at an early age. In 1818-19 he made a tour of Italy, Turkey and Greece, remaining in Rome 1820-6. Upon his return to Venice he devoted his attention to miniature and historical paintings, being professor at the Academy from 1829 to 1850.

ENDER, THOMAS, Austrian artist: b. Vienna 1793, Nov. 4; d. there 1875, Sep. 28. He was twin brother of Johann Ender (q.v.). He also studied at the Vienna Academy, becoming a noted landscape painter. He won the grand prize at the Vienna Academy 1816. Going to Brazil in 1817, he brought back nearly a thousand drawings and water colors. In 1836 he became corrector and later professor at the Vienna Academy, filling that chair until 1849.

EN'DERBY LAND: a region in lat. 65° 57′ s., long. 47° 20′ e., named by John Briscoe in 1831, when on a whaling voyage, in honor of his employer, Samuel Enderby. Briscoe could not approach within 20 or 30 m., and was

unable to say whether it was an island or a strip of continental coast. It was first discovered by Dirk Gherritoz, in 1599, and named for him.

ENDERMIC, a. *ĕn-dėr'mĭk*, or EN'DERMAT'IC, a. *-măt'ĭk* [Gr. *en*, on; *derma*, the skin]: in *med.*, consisting of something to be applied to the skin and to be absorbed by it by way of a remedy for disease. ENDER'MICALLY, ad. *-lĭ.*—The endermic method consists in raising a blister by the ordinary process, opening it by a small puncture—not at the lowest point of the bladder of the blister—gently pressing out the fluid contents, and then injecting a medicinal solution, by a small syringe, through the puncture into the emptied sac; or if the medicine is in the form of powder, it may be scattered over the raw surface. This method is now almost entirely superseded by the hypodermic method: see HYPODERMIC INJECTION.

ENDERON, n. *ĕn'dėr-ŏn* [Gr. *en*, in; *deros*, skin]: in *zool.*, the inner of the two layers of that part of the skin called 'ectoderm' or 'epidermis:' see ECDERON.

ENDICOTT, *ĕn'dĭ-kot*, JOHN: 1589-1665, Mar. 15; b. Dorchester, England: colonial gov. of Mass. He came to America to take charge of the Naumkeag, or Salem, plantation of the Mass. Company, 1628, became gov. of Loudon's plantation 1629, cut the red cross from the royal colors because it savored of popery to him, and was removed and disqualified to hold office for a year. In 1636 he conducted an expedition against the Block Island and Pequot Indians, and his severities then were alleged as the cause of the subsequent Pequot war. He was dep. gov. of Mass. 1641-44,50, and 54, and gov. 1644,49, 51-54, and 55-65; and became sergt.maj.gen. 1645, and pres. of the colonial commissioners 1685. He rigidly enforced the laws; was bitterly opposed to popery, to episcopacy, and to Quakers; executed four Quakers for disobedience of the law of banishment; and aimed at what, according to the intolerance of all parties at that time, he considered a pure church and the highest welfare of the colony.

ENDICOTT, WILLIAM CROWNINSHIELD, American lawyer: b. Salem, Mass., 1826, Nov. 19; d. Boston 1900, May 6; was a descendant of John Endicott (q.v.), the Puritan governor of Massachusetts. He was graduated at Harvard College in 1847; was an unsuccessful candidate for governor of Massachusetts, on the Democratic ticket, in 1884; and was appointed secretary of war in President Cleveland's cabinet in 1885.

ENDIRONS, n. plu. *ĕnd'īrnz* [*end*, and *irons*]: in *prov. Eng.* and *OE.*, two movable iron plates employed to contract the capacity of the fireplace or grate: sometimes another spelling of ANDIRONS, which see.

ENDIVE, n. *ĕn'dĭv* [F. *endive*, a salad—from L. *intŭbum* or *intybum*, chicory], (*Cichorium Endivia*): garden plant from e. Asia, cultivated for fall and winter salad, and for flavoring soups; in restaurants called usually by its French name, *Chicoree*. It may be sown where the plants are to

stand, or in a bed from which to be transplanted. The plants should be a foot apart each way. For early use seed may be sown at the middle of April; for the main crop it should be put in at intervals June 15-Aug. 1. When the plants are grown the tips of the leaves should be tied in a bunch. By this means the inner leaves will be blanched, and their quality as well as appearance greatly improved. For this process from two to four weeks will be required. The leaves sho ld be perfectly dry, and only enough to last two or three weeks should be tied at once. Blanching can be effected also by covering with boards or banking with earth. It can be kept for winter use by packing the roots in a dry cellar. The Green Curled Endive is one of the best varieties.

ENDLESS or PERPETUAL SCREW: a mechanical contrivance, consisting of a screw, the thread of which gears into a toothed wheel at an oblique angle corresponding to the pitch of the screw. It derives its name from the endless recurring effect its thread produces when in motion. It is in general use as a means of producing slow motion in the adjustments of machines rather than as a transmitter of great power.

ENDLICHER, *ĕnt'lĭch-ėr*, STEPHEN LADISLAS: 1804, June 24; b. Pressburg in Hungary: botanist. He was educated in his native town, and in Pesth, and Vienna, and then entered the priesthood, which he, however, abandoned in a few years. In 1827, he commenced his botanical and linguistic studies, and in the following year he was placed at the head of the imperial library at Vienna. In 1836 he was appointed keeper of the museum of natural history at Vienna, and in 1840 he became prof. of botany in the univ., and director of the botanic gardens. Endlicher was much disturbed by the turn political events had taken in 1848, fell into a state of gloom, and in 1849, Mar., put an end to his own life. A few of his works are on philogical subjects, but the great bulk are botanical, the most important being connected with the systematic arrangement of plants. One of his earliest works was *Flora Posoniensis* (1830); in which he describes the plants growing in the neighborhood of Posen arranged according to the natural system. His most important work, *Genera Plantarum secundum ordines naturales disposita*, appeared 1836-50. In it he follows out with great elaboration the system of natural arrangement. It has had great influence on succeeding botanists, and is still one of the most complete works upon systematic botany. Among his works are: *Prodromus Floræ Norfolkicæ* (1833); *Iconographia GenerumPlantarum* (1838); *Mantissa Botanica* (1843); *Mantissa Botanica Altera* (1843); *Grundzüge der Botanik*, written in conjunction with Franz Unger (1843); etc.

ENDOCARDIUM, n. *ĕn'dō-kâr'dĭ-ŭm* [Gr. *endon*, within; *kardĭă*, the heart]: the membrane lining the interior of the heart. EN'DOCAR'DIAL, a. *-ăl*, pertaining to. EN'DOCARDI'TIS, n. *-dī'tĭs*, inflammation of the lining mem-

brane of the heart, resulting in the deposit of fibrine upon the valves: see HEART, DISEASES OF.

ENDOCARP, n. *ĕn′dō-kârp* [Gr. *endon*, within; *karpos*, fruit]: in *bot.*, the inner layer of the pericarp or wall of the seed-vessel, forming the membrane which lines the cavity containing the seeds, as in the apple; the stone or shell that incloses the seed, as in the plum.

ENDOCARPON, n. *ĕn-dō-kâr′pon* [so named because the receptacles are deeply imbedded in the frond]: type of the family *Endocarpidæ*, genus of lichens of the order *Parmeliaceæ* of which Parmelia is the type.

ENDOCHORION, n. *ĕn-dō-kōr′ĭ-on* [Gr. *endon*, within; *chorion*]: in *anat.*, the vascular layer of the allantois.

ENDOCHROA, n. *ĕn-dō-krō′a* [Gr. *endon*, within; *chroa*, skin]: in *bot.*, supposd interior layer of the cuticle.

ENDOCHROME, n. *ĕn′dō-krōm* [Gr. *endon*, within; *chrōmă*, color]: in *bot.*, the coloring matter that in lower orders of plants fills vegetable cells, exclusive of the green; a modification of chlorophyl which in the higher classes of plants gives green color to the leaves. Chlorophyl, by its autumnal change of color, may be said to become endochrome.

ENDOCYST, n. *ĕn′dō-sĭst* [Gr. *endon*, within; *kustis*, a bag or cyst]: in *zool.*, the inner membrane or integumentary layer of a polyzoön.

ENDODERM, n. *ĕn′dō-dėrm* [Gr. *endon*, within; *dcrma*, skin]: in *zool.*, the inner or lower of the two layers of cells into which the blastoderm is divided after the completion of the segmenting process. ENDODERMIC, a. *ĕn′dō-dėrm′ĭk*, of or belonging to the endoderm: see ECTODERM.

ENDOGAMY, n. *ĕn-dŏg′ă-mĭ* [Gr. *endon*, within; *gamos*, marriage]: the practice of forbidding marriage other than within a tribe.

ENDOGEN, n. *ĕn′dō-jĕn*. EN′DOGENS, n. plu. *-jĕns* [Gr. *endon*, within; *gennăō*, I produce]: in *bot.*, that division of the vegetable kingdom, as palms, grasses and rushes, whose growth takes place from within, and not by external concentric layers, as in the *exogens;* rather those plants whose vascular bundles are not arranged concentrically, but scattered in the interior. ENDOGENOUS, a. *-ĕn-dŏj′ĕ-nŭs*, increasing by internal growth. ENDOG′ENITES, n. plu. *-nīts*, fossil stems and fragments exhibiting the endogenous structure. *Note.*—The term ENDOGEN is inaccurate and is passing into disuse.

ENDOG′ENOUS PLANTS, or EN′DOGENS: one of the great classes into which the vegetable kingdom is divided, the others receiving the corresponding designations of *Exogenous Plants* and *Acrogenous Plants.* The character from which this designation is derived is found in the structure of the stem, which does not increase in thickness by additional layers on the outside like the *oxogenous* stem, familiarly illustrated in all the trees of the colder parts of the world, but receives its additions of woody matter

in the interior; and in general does not continue to increase indefinitely in thickness like the exogenous stem, but is arrested when a certain thickness has been attained, different in different species, and afterward increases only in length. When a transverse section is made of an endogenous stem, numerous bundles of vessels are seen dispersed irregularly in cellular tissue; the younger and softer parts of the stem exhibiting the cellular tissue in greatest proportion, the older and lower parts abounding chiefly in vascular bundles, which are, however, somewhat scattered in the central part of the stem, and are densely aggregated toward the circumference, there, in the palms generally, forming very hard wood, in some of them wood so hard that it cannot be cut with a hatchet. The stems of endogenous plants in the far greater number of cases produce terminal buds only, and not lateral buds, and are therefore unbranched. From the bases of the leaves, definite bundles of vascular tissue converge toward the centre; but these extending downward extend also outward, and thus an interlacing of fibres takes place, which contributes not a little to the strength and compactness of the wood in the lower part of the stem. As the fibres extend downward, they also become attenuated, spiral and porous vessels disappearing, and nothing but the most ligneous substance remaining. It is the hardening of the outer part of the stem which arrests its increase in thickness. Endogenous stems have not a distinct *pith*, nor any *medullary rays*. When the central part is soft and pith-like, yet it is not distinctly separated from the surrounding wood, and has no *medullary sheath*. In many endogenous plants, as in the greater number of grasses, the centre of the stem is hollow. This is not the case at first, when the stem begins to grow; and when any cause makes the growth of the stem unusually slow, so that it is much stunted, it remains solid; the fistular character of the stem is the result of its rapid growth, rupturing the cells of the central portion, which finally disappear. Endogenous stems have no *cambium* and no proper *bark*. There is, indeed a cellular *epidermis;* and there is also within it, and exterior to the hardest woody part of the stem, a comparatively soft layer of a corky substance, called sometimes bark, sometimes *false bark*, which does not separate from the wood below it without leaving myriads of little broken threads, the ends of the fibres which have extended into it from the hardest part of the stem. In those exogenous plants which produce lateral buds and branches, the fibres of the branches on descending to the stem extend on the outside of the proper stem, between its hardest portion and the false bark; and in this way a great thickness is sometimes attained, as in the dragon-tree. In the grasses, a *plexus* of fibres takes place at the nodes, the fibres crossing from one side to the other. Scarcely any tree of temperate or colder climates is endogenous. Almost all the endogenous trees are palms, though a few, as the dragon-tree, belong to other orders. Endogenous plants, however, are numerous

in all parts of the world. Among them are many of the plants most useful to mankind, particularly palms and grasses, all the true corn-plants being included among the latter. Nutritious substances are very extensively produced both in the fruit or seed, and in other parts; poisonous products are comparatively rare, though found in the *Araceæ*, *Liliaceæ*, *Melanthaceæ*, and other orders. Aromatic secretions are characteristic chiefly of one order, *Scitamineæ*. Besides palms and grasses, many endogenous plants are of great beauty, and many produce most beautiful flowers. Lilies and orchids are instances.

Endogenous plants are *monocotyledonous* (q.v.); the terms *endogenous* and *monocotyledonous* are therefore often employed indiscriminately to designate the class. But Lindley distinguishes a class of *Dictyogens* (q.v.), which, though monocotyledonous, have stems approaching the exogenous character. The leaves of endogenous plants generally exhibit parallel venation, which is indeed strictly confined to them, though a venation resembling it, or simulating it, may be seen in some exogenous plants. The seed also germinates in a peculiar manner, different from that of exogenous plants, and to which the name *endorhizal* has been given, the radicle being protruded from within the substance of the embryo, and surrounded by a cellular sheath formed from the integument which it breaks in its egress. See Acrogenous: Exogenous: Cotyledon.

ENDOLYMPH, n. *ĕn′dŏ-lĭmf* [Gr. *endon*, within; Eng. *lymph*]: in *anat.*, the limpid fluid of the membranous labyrinth of the ear; the watery humor of the ear, first described by Antonio Scarpa, hence called Liquor Scarpæ, and containing two small calcareous substances called otoconites: see Ear.

ENDOLYMPHANGIAL, a. *ĕn-dō-lĭm-făj′ĭ-al* [Gr. *endon*, within; L. *lympha*, water; Gr. *angeion*, vessel]: in *anat.*, pertaining to the internal part of the lymphatic vessels.

ENDOMORPH, n. *ĕn′do-mŏrf* [Gr. *endon*, within; *morphē*, form]: mineral inclosed in a crystal of some other mineral. Thus crystals of quartz have been found to inclose endomorphs of pearl-spar, titanite, oxide of iron, epidote, sulphate of barytes, etc.

ENDOMETRIUM, n. *ĕn-dō-mē′trĭ-ŭm* [Gr. *endon*, within; *mētra*, uterus]: the lining membrane of the uterus. En′-dometritis, *-trī′tĭs*, n. a disease, inflammation of the endometrium.

ENDONEPHRITIS: see Pyelitis.

ENDOPARASITE: see Entozoön.

ENDOPHAGY, n. *ĕn-dŏf′a-jĭ* [Gr. *endon*, within; *phagō*, I eat]: that kind of cannibalism in which only persons of the same tribe are eaten. Endophagous, a. *ĕn-dŏf-a-gŭs*, practicing endophagy.

ENDOPHLŒUM, n. *ĕn′dō-flē′ŭm* [Gr. *endon*, within; *phloios*, the bark of trees]: the inner layer of the bark of trees; the liber.

ENDOPHYLLOUS, a. *ĕn-dŏf-ĭl-ŭs* or *ĕn′dō-fĭl′lus* [Gr. *endon*, within; *phuslon*, a leaf]: in *bot.*, evolved within a leaf or sheath.

ENDOPHYTE, n. *ĕn′dō-fīt* [Gr. *endon*, within; *phuton*, a plant]: a parasitic plant, usually a fungus, living within another organism.

ENDOPLASM: see CHYME-MASS (CHYME).

ENDOPLEURA, n. *ĕn′dō-plō′ră* [Gr. *endon*, within; *pleura*, a side]: the inner covering of the seed immediately investing the embryo and albumen; the tegmen.

ENDOPODITE, n. *ĕn-dŏp′ŏ-dīt* [Gr. *endon*, within; *podēs*, feet]: in *zool.*, the inner of the two secondary joints into which the typical limb of a crustacean is divided.

ENDOPTILE, n. *ĕn-dŏp′tīl* [Gr. *endon*, within; *ptilon*, a feather]: in *bot.*, having an embryo with the plumule rolled up in the cotyledons, as in the endogenous plants.

ENDORHIZAL, a. *ĕn′dō-rī′zăl* [Gr. *endon*, within; *rhiza*, a root]: having a root within—applied to plants whose rootlets burst first through the coverings of the seed before elongating downward.

ENDORHIZEÆ, n. *ĕn-dō-rīz′ē-ē* [Gr. *endon*, within; *rhiza*, a root]: in *bot.*, name given in 1808 by Richard to the great sub-kingdom of plants termed by De Candolle, in 1813, *Monocotyledonæ* or *Endogenæ*.

ENDORSE: see INDORSE, also BILL.

ENDORSE, *ĕn-dawrs′*, in Heraldry: an ordinary containing the fourth part of a pale. *Endorsed*, or *indorsed*, signifies that objects are placed on the shield back to back.

ENDOSARC, n. *ĕn′do-sârk* [Gr. *endon*, within; *sarkos*, flesh]: in *zool.*, inner molecular layer of sarcode in the Amœba and allied Rhizopods.

ENDOSKELETON, n. *ĕn′dō-skĕl′ĕ-tŏn* [Gr. *endon*, within; *skeleton*, a dry body]: the internal or bony structure of man and other animals, in contradistinction to *exoskeleton*, which is the outer and hardened covering of such animals as the crab and lobster.

ENDOSMOSE, n. *ĕn′dō-smōs′* [Gr. *endon*, within; *osmos*, a thrusting, impulsion]: ENDERMOSIS, that property of membranous tissue by which fluids of unequal densities, when placed on opposite sides of it, are enabled to pass through and intermix. ENDOSMOSIS AND EXOSMOSIS [see EXOSMOSIS]: terms applied by Dutrochet, the first investigator, to the transfusion that takes place when two liquids or two gases of different densities are separated by an animal or a vegetable membrane. As the transmission has no necessary relation to outward or inward, the term *osmosis*, or *osmotic action*, is now preferred. See DIFFUSION.

This action performs a very important part in living organisms, and explains many phenomena of the circulation of sap and the processes of nutrition, previously referred only to the wonderful action of vital energy. Thus, the blood continually streaming through the capillary vessels,

gives forth a portion to the surrounding cells, and so supplies them with the necessary chyle. This may, however, by the expansion of the capillary vessels (see INFLAMMATION), lead to immoderate exudation. On the other hand, the blood, in passing by, takes up a number of worn-out constituents of these cells, and in this way serves, by the exchange which it effects, to restore the body, and to disburden it of products which have become useless.—In plants also, osmosis performs an important part in the process of nutrition and the motion of the sap. The substances in the cells of plants are usually denser than the fluids without, and thus a process of endosmosis takes place, by which the plant is supplied in the first instance from the soil, being incapable, however, of appropriating any nourishment which is not presented in a liquid state to the fibrils of its roots; while that which the roots give off by exosmosis is supposed gradually to unfit the soil for the growth of the same kind of plant. The bursting of the capsules of some kinds of plants is owing to a process of endosmosis going on in the cells, as in the fruit of the elaterium or squirting cucumber. Some of the *Entozoa*, as tape-worms, seem to live entirely by *endosmosis*. See OSMOSIS. ENDOSMIC, a. *ĕn-dŏs′mĭk*, same as ENDOSMOTIC. ENDOSMOMETER, n. *-dŏz-mŏm′ė-tėr* [Gr. *metron*, measure]: instrument to measure the rapidity of the passage of a less dense fluid through a membrane which separates it from a denser fluid. ENDOSMOMETRIC, a. *-momėt′rĭk*, pertaining to or designed for the measurement of endosmotic action. ENDOSMOSMIC, a. *dŏs-mos′mĭk*, same as ENDOSMOTIC. ENDOSMOT′IC, a. *-mŏt′ĭk*, pertaining to endosmosis.

ENDOSPERM, n. *ĕn′dō-spėrm′* [Gr. *endon*, within; *sperma*, a seed]: in *bot.*, albumen formed within the embryo-sac. ENDOSPERMIC, a. *-sperm′ĭk*, in *bot.*, term applied to seeds containing endosperm, as in the *Grammeæ*, *Umbelliferæ*. etc.; relating to or accompanied by the endosperm, as an *endospermic embryo*.

ENDOSPOROUS, a. *ĕn′dō-spō′rŭs* [Gr. *endon*, within; *spora*, seed]: applied to fungi that have their spores in a case.

ENDOSTOME, n. *ĕn′dō-stōm′* [Gr. *endon*, within; *stoma*, a mouth]: the passage through the inner integument of an ovule.

ENDOTHECIUM, n. *ĕn′dō-ihē′shĭ-ŭm* [Gr. *endon*, within; *thēkē*, a box]: the inner lining of the anther-cells.

ENDOTHELIUM, n. *ĕn-dō-thē′lĭ-ŭm* [Gr. *endon*, within: *thēlē*, nipple]: called also VASALIUM: the lining membrane of serous, synovial, or other closed sacs—somewhat resembling epithelium. ENDOTHELIO′MA, n. *-lī-ō′mâ:* malignant tumor, a growth from endothelium.

ENDOW, v. *ĕn-dow′* [*en*, in; F. *douer*, to give a dowry to; *en*, in; L. *dotem;* F. *dot;* It. *dote*, a marriage-gift]: to settle on or furnish with in permanency; to settle money or property on permanently; to enrich or provide with, as a

gift, quality, or faculty. ENDOW'ING, imp. ENDOWED', pp. *-dowd'*. ENDOW'ER, n. one who. ENDOW'MENT, n. that which is bestowed or settled on; property set apart and secured in perpetuity for the support of a church, college, hospital, etc.; any gift of nature, any faculty or quality of mind.

ENDOWMENT INSURANCE. See INSURANCE, LIFE.

ENDUE, v. *ĕn-dū'* [OF. *endoer* or *endouer*, to endow]: to endow; to supply with. ENDU'ING, imp. ENDUED, pp. *ĕn'dūd'*. *Note.*—This is an older spelling of 'endow': *indue*, however, which is a totally different word, is erroneously employed by our best OE. writers in the sense of 'endow': see INDUE.

ENDURE, v. *ĕn-dūr'* [F. *endurer*—from L. *indūrārĕ*, to make hard—from *in*, in; *dūrŭs*, hard; It. *indurare*]: to bear; to suffer with patience; to submit; to undergo; to last; to continue in same state; to remain. ENDU'RING, imp.: ADJ. capable of sustaining. ENDURED', pp. *-dūrd'*. ENDU'RABLE, a. *-ră-bl*, that can be borne. ENDU'RABLY, ad. *-blĭ*. ENDU'RABLENESS, n. *-bl-nĕs*, act or state of that which endures. ENDU'RINGLY, ad. *-lĭ*. ENDU'RANCE, n. *-răns*, a bearing or suffering; continuance; patience; fortitude.—SYN. of 'endurance': suffering; resignation;—of 'endure': to abide; continue; brook.

ENDYMION, *ĕn-dĭm'ĭ-on*, in Greek Mythology: son either of Zeus or of Aëthlios; he followed, according to some accounts, the occupation of a herdsman or hunter; according to others, was king of Elis. On account of his uprightness, he is said to have received, at his own request, from Zeus, the gift of immortality, unfading youth, and everlasting sleep; but another version is, that Zeus having taken him up to Olympus, Endymion fell in love with Here (Juno), and was condemned by her enraged husband to eternal sleep on Mount Latmos. Others, again, prettily fable that Selene (the Moon), charmed by the beauty of the youth, conveyed him to Caria, and sent him to sleep on Mount Latmos, that she might nightly kiss him unobserved. The Eleans, on the contrary, declared that he died among them, and in proof of it were wont to show his monument. The myth of Endymion has been happily interpreted by Max Müller in his article on Comparative Mythology, in *Oxford Essays* (1856). Endymion, according to him, is one of the many names of the sun, but with special reference to the setting or dying sun, being formed from *enduo*, probably a dialetic variety of *duo*, a Greek verb which means 'to go down' as the sun. Endymion sleeps in the cave of Latmos, i.e., of night (from the same root as Leto or Latona, the night). So far the myth poetically describes certain phenomena of nature, the sinking of the sun in the west, and the rising of the moon, that seems to follow his departing beams. But the original signification of the metaphors becoming lost, as might naturally happen when the words expressing them had only a local usage, it was, we may say inevitable that people should transfer the metaphors to

persons, and invent a history to supply the place of the vanished poetry. And this invention, or, more properly, explanation (for it was doubtless made in good faith), is what properly constitutes the myth of Endymion. The story has been made the subject of a poem by Keats.

ENDYMION, n. *ĕn-dĭm′ĭ-on:* in *bot.*, genus of *Liliaceæ*, tribe *Hemerocallideæ*. *Endymion nutans* is one of the names given to the English bluebell; the *Hyacinthus non-scriptus* and the *Agraphis nutans* of other botanists.

-ENE in *chem.*, verbal termination to denote that the fatty hydrocarbon belongs to the olefine series, Cn H2n. But this termination is applied to hydrocarbons of the aromatic series without regard to their formula; thus, naphthalene, $C_{10}H_8$, ought to be called a naphthaline.

ENECIA, n. *ē-nē′shī-a* [Gr. *ēnekēs*, lasting, continuing]: in *med.*, continued fever, including inflammatory typhus, and synochal fevers.

ENEID, or ÆNEID, n. *ē′nē-ĭd:* a famous Latin epic poem by the anc. poet Virgil—so named from its chief hero, Æneas, *ē-nē′ăs:* see ÆNEAS.

ENEMA, n. *ĕ-nē′mă* [Gr. *enĭēmī*, I cast or throw in]: plural, enemata: an injection of fluid into the rectum—of nutrient fluid, of a medicated solution, or of plain water. See CLYSTER.

EN′EMIES, OF THE UNITED STATES: any kind of assistants, whether by joining in acts of hostility, or sending supplies, etc., to subjects of states at war with this country —such subjects being held as enemies, even though war may not have been solemnly proclaimed: see ENEMY. All such aid and comfort is by the constitution, treason. To incite to hostilities, the subjects of a state at amity with the United States does not fall under this provision. But if the subjects of a friendly state make a hostile invasion, any U. S. citizen rendering assistance is deemed guilty of treason. See TREASON.

ENEMY, n. *en′e-mĭ* [F. *ennemi*—from L. *inĭmīcŭs*, an enemy—from *in*, not; *amīcus*, a friend: It. *inimico*]: one who hates another person; a foe; an adversary; an opposing armed force, naval or military; opponent; antagonist.—*Enemy*, in *civil law*, is one with whom war has been publicly declared; all other kinds of assailants are pirates or robbers. *Hostes hi sunt qui nobis, aut quibus nos, publice bellum decrevimus; cateri latrones aut præaones sunt.—Digest*, i. 16, 118. Thus in order to constitute an enemy, there must be a public declaration of war. This declaration must also be made by a duly organized state or kingdom, for a declaration of war by any turbulent body of men is not sufficient; and a hostile act committed by private citizens will not justify a war, unless that act be sanctioned or wantonly permitted by the government. The purpose for which this public declaration is required, is stated by Grotius to be that it may be clearly known that the war is undertaken not as a venture, but by the will of the two people. Hostilities having been formally declared, every

subject of the hostile nations becomes an enemy of the opposing state, as do likewise those independent nations which attach themselves to the interests of either party. According to ancient usage, the utmost violence and cruelty was lawful toward those who were enemies of the state; but by the humane principles which prevail in modern times, warfare is to be carried on subject to certain general rules, which are intended as much as may be to abridge the calamities of war, and to protect the rights of individuals. Thus, an army invading an enemy's country is bound to allow, as far as possible, the peaceable inhabitants to remain unmolested. Unnecessary devastation of the country and the seizure of private property are also contrary to the laws of civilized war; and Grotius lays it down that the use of poisoned weapons, and of assassination, and violence to women, are to be reprobated. On the other hand, individuals taking up arms, without the sanction of the state, in order to annoy an invading enemy, are regarded as lawless marauders. The result of this distinction is, that such persons are treated not as prisoners of war, but are subject to be summarily dealt with by the commander of the invading army. As to the right of individuals to fit out vessels for the annoyance of the enemy, see PRIVATEER: PIRACY. It appears to be a recognized principle of international law, that the property of an alien enemy residing in either of the hostile states may be confiscated. The Americans, during the war with England, asserted this right in regard to British property found in their territory. But the usage of civilized nations for a long period has much modified the stern rule of law. It is provided by Magna Charta, cap. 30, that if merchants 'be of a land making war with us, and be found in our realm at the beginning of the wars, they shall be attached without any harm of body or goods, until it be known to us, or our chief justice, how our merchants be intreated there in the land making war against us, and if our merchants be well intreated there, theirs shall be likewise with us.' And by 27 Edw. III. c. 17, merchants of a foreign state at war with Britain were allowed 40 days, after proclamation of hostilities, wherein to remove from the kingdom themselves and their goods; and if that space of time were not sufficient, 40 days more were to be conceded to them. Vattel (iii. 4, 63) denies that the right to confiscate the goods of an alien enemy is a right inherent in a state by the law of nations, insisting that a sovereign having permitted foreigners to enter the state, and to continue there, had tacitly promised them full liberty and security for their return. Whatever be the principle, there is no doubt that the universal practice of modern nations has been to respect the property of individuals at the outbreak of hostilities. Provisions are frequently inserted into commercial treaties, stipulating that, in case of war, the subjects of the enemy shall have time to depart, and even that they should be allowed to remain and carry on peaceable trade. As to the practice in regard to EMBARGO and LET-

TERS OF MARQUE, see those titles. The right to confiscate the debts of the subjects of a hostile nation appears to rest on the same basis as that of the confiscation of other property. Trade between the subjects of two hostile powers is absolutely suspended during hostilities, unless permitted by express sanction; and the importation of articles, particularly useful in war is contraband. All such articles, whether supplied by subjects of the enemy, or of another state, are seized and confiscated: see CONTRABAND OF WAR: also PRIZE: PRISONERS OF WAR: INTERNATIONAL LAW: GENEVA CONVENTION. (Grotius, *De Jure Belli et Pacis*, lib. iii. cc. 3 to 7; Kent's *Commentaries*, I. c. 3.)

ENERGETICS, n. *ĕn-ėr-jĕt'ĭks:* in *nat. philos.*, branch of science which investigates the laws relating to physical or mechanical forces, as distinguished from vital. It thus comprehends the consideration of the whole range of physical phenomena.

ENERGICO, *ĕn-ĕr'jē-kō:* Italian term in music, meaning with energy and force; with strong articulation and accentuation, and a marked powerful delivery of the single notes, without losing in distinctness of execution.

ENERGUMEN, n. *ĕn-ėr-gū'mĕn* [Gr. *energoumenos*, possessed with an evil spirit; *energeō*, I am in action]: in *theol.*, one possessed by a spirit, specially by an evil one; a demoniac.

ENERGY, n. *ĕn'ėr-jĭ* [F. *énergie*—from Gr. *enĕrgeï'ă*, action, energy—from *en*, in; *ergon*, work]: power; force; power of doing work (q.v.); vigorous action; efficacy; spirit; life. EN'ERGETIC, a. *jĕt'ĭk*, or EN'ERGET'ICAL, a. *-ĭ-kăl* [Gr. *energētĭkŏs*, having the power of acting, energetic]: possessing force or vigor; vigorous; forcible; powerful; effective. EN'ERGET'ICALLY, ad. *-lĭ*. ENERGIZE, v. *ĕn'-ėr-jīz*, to operate with vigor; to give energy or strength to. EN'ERGI'ZING, imp. EN'ERGIZED, pp. *-jīzd*. DISSIPATION OF ENERGY, the tendency of all energy in the universe to pass into a comparatively useless and unmanageable form, such as uniformly diffused heat: see DYNAMICS: FORCE: THERMO-DYNAMICS.—SYN. of 'energetic': strenuous; potent; efficacious:—of 'energy': vigor; strength; efficiency; emphasis; activity.—CONSERVATION OF ENERGY: see FORCE.

ENERVATE, v. *ĕn'ėr-vāt* or *ē-nėr'vāt* [L. *enervātus*, enervated, rendered effeminate—from *e*, out; *nervus*, nerve: It. *enervare:* F. *énerver*]: to render feeble; to weaken; to enfeeble; to deprive of strength; to debilitate; to unnerve: ADJ. weak; without strength or force. EN'ERVATING, imp.: ADJ. weakening; enfeebling. EN'ERVATED, pp. enfeebled. ENERVATION, n. *ĕn'ėr-vā'shŭn* [F.—L.]: the act of weakening; a weak state of body or debility arising from nervous disorders. ENERVIS, a. *ē-nėr'vĭs* [L.]: in *bot.*, without nerves or veins. ENERVE, v. *ē-nėrv'*, in *OE.*, to break the force of; to weaken. ENER'VING, imp. ENERVED, pp. *ē-nėrvd'*.

ENEURESIS: a symptom of many diseases of the blad-

der resulting in incontinence or involuntary passage of urine. It is a prevalent malady of childhood and only becomes of importance after the period of infancy, when the child should have learned to control the bladder. The control of the bladder is in part a matter of conscious effort, and has its representation in the higher brain-centres. Bladder-control is also exercised by that portion of the sympathetic nervous system found in the solar and sacral plexuses, and likewise in a number of cells in the spinal cord, situated in the lumbar region. Interference with the action of any or all of these centres may result in eneuresis. Disease of the spinal cord may cause excessive irritation of the sympathetic nervous system, and may result in nocturnal eneuresis; and the cutting off of the cerebral control may also bring about this condition. During deep sleep the cerebral control is usually cut off, accounting thus for the prevalence of eneuresis in deep sleep in children. Very frequently the immediate cause of eneuresis is some form of local irritation. This is particularly prevalent in young girls, and should always be removed, if possible, in the treatment. Drug medication is extremely unsatisfactory for this condition. The most efficient measures consist in building up the general nervous system of the patient by tonics, cold baths, and exercise in the open air.

ENFANTIN, *ŏng-fŏng-tăng'*, Barthélemy Prosper: the chief representative of St. Simonism, and as such, usually styled *Père Enfantin:* 1796-1864, Aug. 31; b. Paris; son of a banker. He became a pupil in the *École Polytechnique* 1812, but was expelled 1814, for having joined the pupils who left school and fought against the allies on the heights of Montmartre and St. Chaumont. He was afterward a commercial traveller in Russia, then a banker's clerk, and in 1825 became director of the *Caisse Hypothécaire.* About this time he became a disciple of St. Simon, whose ideas he developed, after the death of their author, in the *Producteur.* After the July revolution, Enfantin associated himself with M. Bazard for the active propagation of St. Simonism. Bazard preached it in its relations to philosophy and politics; Enfantin in its relations mainly to the social state. Soon, however, a schism broke out between the two on the question of marriage and the relation of the sexes. Recognizing the 'mobility' of the affections, Enfantin affirmed that they ought to be 'free,' and of course pronounced against the ties of marriage. Enfantin's views were pushed so far that government deemed it necessary to interfere on the grounds of public decency. The 'Supreme Father' (as his disciples were wont profanely to call him) was, after a trial of two days, sentenced to two years' imprisonment, and to pay a fine of 100 francs. Being released at the expiration of a few months, Enfantin went to Egypt, and after an absence of two years, returned to France, and became a post-master and farmer in the vicinity of Lyon. In 1841, he came to Paris, and was appointed a member of the Scientific Commission

for Algiers, and on his return from Africa, wrote a sensible, interesting book, entitled *Colonisation de l' Algérie* (Paris 1843). After the revolution of 1848, he edited the journal entitled *Le Crédit Public*, a paper retaining much of the old St. Simonian character, but which had to stop in 1850 for want of funds. Enfantin afterward held an important situation on the Lyon and Mediterranean railway. His principal works are his *Doctrine de St. Simon*, in conjunction with others (1830); his *Traité d' Économie Politique; La Religion Saint-Simonienne* (1831); *Moral; Le Livre Nouveau* (1832); *Correspondance Philosophique et Religieuse* (1847); *Correspondance Politique* (1849); *La Vie Eternelle, Passé, Présent, Future* (1861).

ENFEEBLE, v. *ĕn-fē′bl* [*en*, and *feeble*]: to weaken; to reduce the strength of. ENFEE′BLING, imp.: ADJ. weakening; debilitating. ENFEE′BLED, pp. *-bld:* ADJ. weakened; deprived of strength. ENFEE′BLEMENT, n. *-bl-mĕnt*, the act of weakening.

ENFEOFF, v. *ĕn-fĕf′* [*en*, in, and law L. *fĕŏffārĕ*, to confer a fee on one (see FEE and FEUDAL)]: to invest with a fee or estate; to give a right of property in lands or houses by a deed or instrument. ENFEOF′FING, imp. ENFEOFFED′, pp. *-fĕft′*. ENFOFF′MENT, n. the act of giving the fee-simple of an estate; the deed or instrument by which it is given: see FEOFF.

ENFIELD, *ĕn′fēld:* town of Hartford co., Conn.; on the Conn. river, and the New York, New Haven and Hartford railroad; 16 m. n. of Hartford. It contains the villages of Thompsonville, noted for its great carpet factory with over 300 looms and a manufacturing capacity of nearly 6,000,000 yds. annually; and Hazardville, where is one of the most extensive powder mills in the world, beside a community of thrifty Shakers. The first bridge over the Conn. river was built from Enfield to Suffield 1808; an iron truss bridge was erected below it 1866 at a cost of $265,000; and a canal 5½ m. long has been constructed around the falls of the Conn. within the town limits. Enfield has several churches, high school, savings bank, and sewing-machine, plow, carriage, sash and blind, hat, brick, and harness factories. It was settled 1681, and belonged to Springfield, Mass., till 1752. Pop. (1910) 9,719.

ENFIELD, *ĕn′fēld:* town of Middlesex co., England. Its modern growth is due to the government small arms factory, producing the rifles of the British army. The grammar school is housed in an ancient court palace of Edward VI. Pop. 42,700.

ENFILADE, v. *ĕn′fĭ-lād′* [F. *enfilade*, a range, a row—from *en*, in; L. *filum*, F. *fil*, a thread: It. *infilare:* Sp. *enfilar*]: to scour, rake, or pierce with shot or shell a body of soldiers in the direction of the length of the line which they form; to sweep the deck of a ship, or a trench, or line of rampart, from end to end, with shot or shell: N. a line or straight passage; the situation of a place that may be raked with shot in the direction of its length; the fire of

artillery raking a trench or a line of soldiers. EN'FILADING, imp. EN'FILADED, pp.—A besieging battery so placed as to send its shot along any part of the line of a fortification, and inside the parapet, does great execution in dismounting the guns, which thus present the largest surface to the balls. Hence the rampart lines should be so planned that their prolongations may fall in situations inaccessible to the enemy. Where this is not possible, the lines are either broken, or are protected by bonnets (q.v.), or by traverses (q.v.), or blindages (q.v.). In the siege of a fortress, the trenches of approach are cut in a zigzag, to prevent the defenders enfilading them from the walls.

ENFLEURAGE, *ŏn-flė-räzh*, in perfume-making, the method of extracting, by contact and absorption, the scents of flowers used for perfumery. For this purpose wooden frames containing glass smeared with pure grease are filled with flowers, which are allowed to remain from one to six days. The grease gradually absorbs the scent, the flowers being renewed from time to time. The scent is afterward separated from the grease by soaking the latter in strong spirits of wine. Sometimes wire frames covered with cotton cloths, saturated with fine olive-oil, are used instead of glass. In this manner the most delicate odors are extracted from flowers, which would be lost in the process of distillation.

ENFORCE, v. *ĕn-fōrs'* [F. *enforcir;* OF. *enforcer*, to strengthen: *en*, to make, and *force*]: to constrain; to compel; to urge with energy; to give strength or force to; to put in execution, as the law; to impress on the mind; to drive. ENFOR'CING, imp. ENFORCED', pp. *-fōrst'*. ENFORCE'MENT, n. compulsion; a putting into execution. ENFOR'CEDLY, ad. *-lĭ*.

ENFRANCHISE, v. *ĕn-frăn'chĭz* [*en*, in or on, and *franchise*]: *originally*, to set free, as from slavery, restraint, or disability; to invest with civil and political privileges; to admit to all the rights and privileges of a freeman; to invest with the right of voting for public officials. ENFRAN'CHISING, imp. ENFRAN'CHISED, pp. *-chĭzd*. ENFRAN'CHISEMENT, n. the admission to civil and political rights and privileges. ENFRANCHISEMENT OF COPYHOLDS: see COPYHOLD.

ENGADINE, *ĕn-gâ-dēn':* famous valley in Switzerland, canton of Grisons, second only to the Valais in length, extending n.e. about 65 m. along the banks of the Inn, from the foot of Mount Maloja to the village of Martinsbruck. It is divided into two portions—that toward the s.w., called the Upper E., and that toward the n.e., the Lower E. The latter is wild and bleak; pent up within narrow limits among the hills, and having a huge barrier of glaciers between it and Italy, its climate is dismal. Frost and snow occur in July, and winter prevails for nine months of the year. The Upper E. is more open, and has much fine meadow-land. The Inn, which enters the valley at its s.w. or upper extremity, and flows through it, has many towns upon its banks, the highest of which, St. Moritz, is about

6,000 ft. above sea-level, while the lowest, Martinsbruck, is 3,343 ft. The inhabitants apply themselves principally to the rearing of cattle; they also make cheese, and export it largely. More than one-half of the young men emigrate at an early age, and betake themselves to continental capitals, where they often attain comparative wealth, in which case they almost invariably return, build a house in their native valley, and therein spend the remainder of their days. Nearly all the people are of the Reformed or Calvinistic Church. The language generally spoken is the Ladin (a corruption of Latin), a Romanic tongue, but differing from the other Romanic dialects of the Rhaetian Alps, and resembling the Italian. Pop. 11,000.

ENGAGE, v. *ĕn-gāj′* [F. *engager*, to enlist—from *en*, in; *gage*, a pledge]: to occupy, as one's time; to undertake; to win, as affection; to hold, as the attention; to embark in, as in business; to bespeak, as rooms or a partner in a dance; to bind one's self as surety; to enlist for a service; to unite by contract; to begin to fight. In *mechanics* a cog-wheel engages another when their cogs interlock so as to turn together. ENGA′GING, imp.: ADJ. winning; attractive; pleasing. ENGAGED′, pp. *-gājd′:* ADJ. pledged; promised; affianced, attached; earnestly employed. ENGA′GEDLY, ad. *-jĕd-lĭ*. ENGA′GEDNESS. n. *-jĕd-nes*. ENGAGE′MENT, n. [F.—L.]: a mutual agreement to fulfil an arrangement or contract at a specified time; an appointment; a fight; a battle; an obligation; a compact. ENGAGEMENT OF MARRIAGE: see BETROTHMENT. MILITARY ENGAGEMENT, conflict between two armies or hostile forces. Almost every term applicable to armies in the field bears relation, in some way or other, to a hostile engagement: see those titles. NAVAL ENGAGEMENT, conflict between war vessels. In the small war-vessels of ancient times, before the invention of gunpowder, a naval engagement usually began by running the galleys violently against each other, to crush or sink the enemy by means of the beak or prow. The prows were, for this purpose, armed with brazen or iron points. On the deck was sometimes a kind of turret filled with soldiers, the probable precursor of the *forecastle* in modern ships; and there was also frequently a platform for accommodating swordsmen, slingers, and javelinmen. High and bulky ships, of no great length, were best for this kind of warfare. Sometimes a massive piece of iron or lead, called a *dolphin*, was let down violently from the yard-arm, to crush or break through some part of the enemy's vessel. The men fastened sickles to the end of long poles, to cut the enemy's rigging and sails. Other means for carrying on a hostile attack were *battering rams*, heavy maces with very long handles, stone-throwing machines, and grappling irons. SYN. of 'engagement:' employment; occupation; avocation; business; promise; word; combat; contest.

ENG AND CHANG: see SIAMESE TWINS.

ENGARRISON, v. *ĕn-găr′ĭ-sŭn* [*en*, in, and *garrison*]: to protect by a garrison; to furnish with a garrison.

EN-GEDI, *ĕng'ghē-dī* (Arabic, *Ain-Jedi*, 'fountain of the kid'): strictly, the name of a perennial fountain on the w. side of the Dead Sea, but is applied also to the wilderness back of the fountain, and to the difficult pass leading up to it. Here in the days of Abraham (B.C. 1900) the Amorites dwelt securely in the caverns of the rocks until they were driven out by allied forces of northern kings. More than eight centuries later (B.C. 850) David, in his flight from Saul, took refuge in the same caverns 'among the rocks of the wild goats.' After David, Solomon, not needing the caverns for defense, used the fountain in irrigating the surrounding region, and thus made famous vineyards and gardens; of which the terraced ruins yet remain. A thousand years later (in the time of Christ) the Jewish sect of the Essenes, fleeing not from hostile armies but, as they supposed, from the corrupting influences of social life, made their homes in the silent caverns around the flowing waters. And, 18 centuries after Christ, Drs. Robinson and Smith, travellers from the western world, on a tour to the Dead Sea, descending a frightful pass more difficult than those of Lebanon or of the Alps, came suddenly to the beautiful fountain bursting forth in a copious stream from a ledge of the rock and rushing down, between a thicket of shrubs and trees, 400 ft. into the sea. And the cliffs were still a refuge for the wild goats as they had been thousands of years before.

ENGELHARDT, *ĕng'ĕl-hârt*, JOHANN GEORG VEIT: 1791, Nov. 12,—1853, Sep. 13; b. Neustadt on the Aisch: German theologian. He studied at Erlangen, where, 1820, he was appointed extraordinary prof., and in 1822 ordinary prof. of theology. Patristic and mediæval dogmatics, and Neoplatonism, are the chief subjects which he investigated. In 1820, he published at Erlangen, a translation of the first *Ennead* of Plotinus; in 1823 appeared his translation of the writings ascribed to Dionysius the Areopagite. His *Kirchengeschichtlichen Abhandlungen* (Erl. 1832), *Auslegung des Speculativen Theils des Evangeliums Johannis durch einen deutschen mystichen Theologen* (Erl. 1839), and his contributions to the history of the mystical theology, entitled *Richard von St. Victor und Johannes Ruysbroek* (Erl. 1808), are works of great value, and have thrown a new light on many important points. Very useful, too, especially for the richness of their special notices, are his *Handbuch der Kirchengeschichte* (Erl. 1834), and *Dogmengeschichte* (Neustadt 1839). E. wrote many learned dissertations in the *Journal of Historical Theology*, among which were *Ueber die Hesychiasten*, and *Ueber Erasmus Sarcerius*.

ENGELHARDTIA, n. *ĕn-jĕl-hârd'shĭ-a* [named after a Dutch gov. of the n.w. part of Java]: in *bot.*, genus of *Juglandaceæ*. It consists of verry esinous trees. *Engelhardtia spicata* is a large tree, 200 feet ft. high, the trunk of which, in Java, is cross-cut into cart-wheels.

ENGELS, *ĕng'ĕls*, FRIEDRICH, English socialist: b. Bannen, Prussia, 1820, Nov. 28; d. London 1895, Aug. 5. He lived mainly at London after 1869. He was an intimate

friend of Karl Marx (q.v.), and his most efficient helper in the work of organizing the Socialist movement. In 1870 Engels was corresponding secretary of the International Workingmen's Society for Belgium, Italy and Spain. With Marx he wrote the *Communist Manifesto* (1847); he also wrote *The Working Class in England in* 1844 (new edition 1892); *The Origin of the Family; The Development of Socialism from Utopia to Science* (1894, a part of a large work left unfinished); and edited Marx's *Capital.*

ENGENDER, v. *ĕn-jĕn'dėr* [F. *engendrer,* to generate; to produce—from L. *ingĕnĕrārĕ,* to engender—from *in,* in; *genĕrō,* I breed, I bring forth: It. *ingenerare*]: to form; to cause to exist; to occasion; to produce. ENGEN'DERING, imp. ENGEN'DERED, pp. *-dėrd.*—SYN. of 'engender': to breed; procreate; propagate; generate; beget; cause; form.

ENGHIEN, *ŏng-ghe-ăng',* LOUIS ANTOINE HENRI DE BOURBON, Duc d': 1772, Aug. 2.—1804, Mar. 20; b. Chantilly, France, only son of Prince Henri Louis Joseph, Duc de Bourbon. In 1789 he travelled through several countries of Europe. In 1792 he entered the corps of *émigrés* assembled by his grandfather, the Prince of Condé, on the Rhine, and commanded the vanguard 1796-99. At the peace of Lunéville, 1801, he went to reside at Ettenheim, an old château on the German side of the Rhine, not far from Strasburg, and within the territories of the Duke of Baden. Here he married the Princess Charlotte of Rohan Rochefort, and lived as a private citizen. When the conspiracy of the Bourbon princes, headed by Cadoudal, Pichegru, etc., against the life and authority of Bonaparte, was discovered at Paris, the latter chose to believe that the Duc d'Enghien was privy to it, although there was not a tittle of evidence to prove this. Perhaps Bonaparte was afraid that the valor and humanity of the last descendant of the great Condé might at some day prove dangerous to his power. Be that as it may, he unscrupulously resolved to seize the person of the duke. On the night of 1804, Mar. 17, the neutral territory of Baden was violated, and the château of Ettenheim surrounded with a body of soldiers and gendarmes. The duke, at first, endeavored to defend himself; but the force was too great to be opposed, and he, with several friends and domestics, was captured, and carried prisoner to Strasburg, and immediately afterward to Vincennes. On Mar. 20 he was tried before a court martial of eight officers, and after an examination of five hours was condemned to death. Half an hour later the sentence was put into execution. So cruel and audaciously criminal an act has fixed a deep and lasting stigma on the character of Bonaparte. M. Dupin has published the records of the trial, and shown the illegality of the proceedings of the military commission. This illegality was publicly acknowledged by General Hullin, president of the court. After the Restoration, the bones of the judicially murdered duke were taken up, and interred in the chapel of the castle at Vincennes.

ENGINE, *en′jĭn*, n. [Fr. *engin*, a machine; L. *ingenium*, *in*×*gigno*, produce]. A machine for converting some form of energy, as heat, into mechanical power, for doing work; a motor. Primarily the word was used in the sense of machine, and the early catapults were called engines of war. This sense survives in the paper-making industry, where machines for producing pulp or cutting up rags are still called engines; it is also employed in a few other instances, as a graduation-engine (a machine for very accurate ruling of graduation lines).

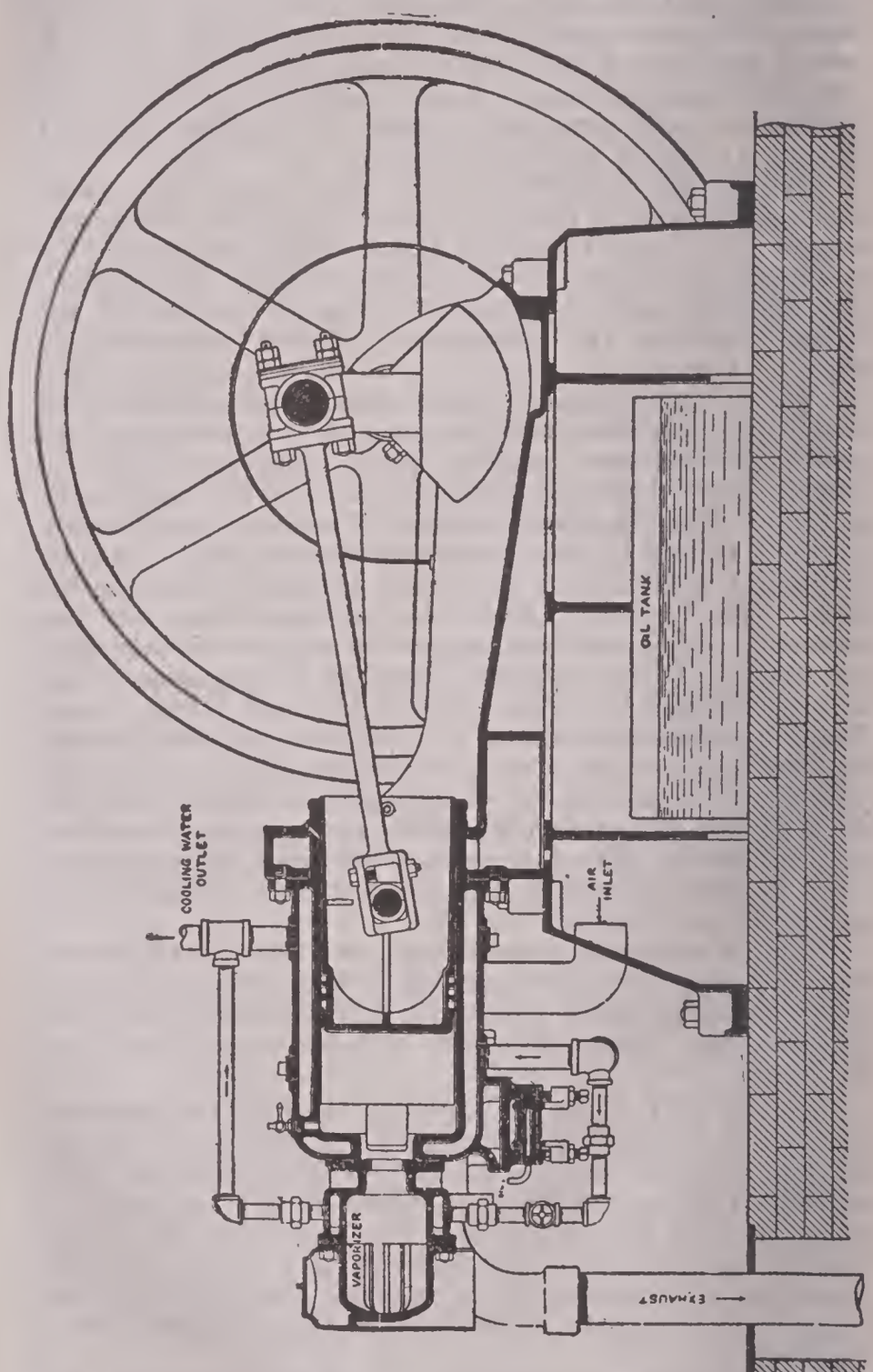
Engines for delivering power are divided into those that heat a motive fluid by means of a fire, as the steam-engine (q.v.), and those that ignite a fluid mixture within a chamber, so that it expands suddenly, these being internal-combustion engines. The most common of the latter class are the gas-engine and the gasoline-engine (q.v.). Gunpowder engines have been attempted, but prove too dangerous. Engines driven by explosions of coal-dust have also been the subject of experiment, but never reached the practical stage. The stationary oil engine, operating with petroleum oil, has met with some success. The Hornsby-Akroyd oil engine (see illustration), is typical of the internal-combustion class. It may be operated with crude petroleum, stored in a tank in the base. The oil first goes to the vaporizer, then into the cylinder. Ignition or burning of the mixture of vaporized oil and air in the cylinder produces an expansion that drives the piston. This ignition in most internal-combustion engines is produced by a flame or an electric spark, but in the oil engine here pictured the heat for firing the mixture is generated by compression, together with the heat of the vaporizer walls (which in operation retain a dull red heat). The expansion of the gas takes place only once in four revolutions, and will be better understood by reading Gas -Engine.

Engines which vaporize alcohol, or a mixture of alcohol and acetylene gas, also ether, have been constructed, and would be satisfactory if these liquid fuels were sufficiently cheap. See Steam-Engine, Gas-Engine, Gasoline-Engine.

ENGINEER, n. *-jĭ-nēr*, one who constructs or manages an engine; one skilled in forming plans of work for offense or defense for an army: a designer of great machines to be employed in the arts and manufactures; one employed in planning and superintending the formation of public works, such as roads. En′gineer′ing, n. the work, skill, business, or profession of an engineer; the practice of an engineer. Enginery, n. *ĕn′jĭn-rĭ*, in *OE.*, engines of war; artillery.

ENGINEERING, Civil: the art of designing and superintending such works as roads, railways, bridges, canals, harbors, docks, works for supplying water to towns, drainage and sewerage works, mining machinery, and the working of metals.

The civil engineering profession is subdivided into sever-



A Hornsby-Akroyd Oil Engine.

al sections. The railway engineer projects and superintends the execution of railways and all the works in connection with them, such as the alteration of roads and streams, the construction of viaducts, bridges, cuttings, and embankments. The hydraulic engineer constructs the works connected with the supply of water to towns, the filtering of water, its collection in reservoirs, and its distribution through a town or district; the irrigation and drainage of tracts of country; the projection of low lands from inundation, and the use of water as a motive power. The docks and harbor engineer has the management of all works connected with the sea or navigable waters, such as the construction of piers, breakwaters, docks, harbors, and light-houses. The mechanical engineer is concerned principally in the manufacture of machinery, the working of metals, the construction of ships, steamers, cannon, and all the various structures in which the metals bear a prominent part. The mining engineer discovers minerals and manages mines; there are engineers also engaged specially in the drainage of towns; and there are other less prominent divisions of the profession.

In all engineering works, the *contractor* takes a very important part; he executes the works from the designs, and under the direction and superintendence of the engineer, and on his ability and good management the success of undertakings materially depends.

The engineering works of antiquity are numerous and prominent, many of them remaining while all other traces of their construction have been swept away. The most notable of the works belonging to very remote antiquity are the harbors of the Phœnicians, the palaces and sewerage of Nimroud, and the pyramids of Egypt; next in order come the harbors of ancient Greece, the bridge of boats across the Dardanelles, made by Xerxes, to transport his immense army into Europe, and his canal across the isthmus of the peninsula of Mount Athos. The constructions of ancient Rome claim attention—its theatres, temples, baths, and aqueducts, some of which carried water from distances of more than 50 m. into Rome; its roads, bridges, and drainage-works vie in extent and magnificence with the most celebrated works of modern times.

From that period down to the commencement of the 18th c., the most extensive works executed are the canals, embankments, and other hydraulic constructions by the Dutch for purposes of inland navigations, and to protect their low lands from the sea; the canals of n. Italy, the cathedrals and fortifications of mediæval Europe.

Civil engineering, as a distinct *profession* may be said to have originated, in England, about the middle of the last century; since that time, the improvements in the steam-engine by James Watt, its subsequent application to the railway system by George Stephenson, and its use in navigation, have given a great impulse to commerce and civilization; which, in their turn, have created in many countries the necessity for the numerous and magnificent engineering works of modern times; such as innumerable

railways, roads, and canals; and the bridges, water-works, docks, harbors, and vessels that facilitate commerce.

The education of those who would rise to eminence in the profession, must embrace a fair knowledge of pure mathematics and of the mixed sciences of natural philosophy, such as mechanics, hydrostatics, hydraulics, and optics. They should acquire a knowledge of the principles of projections, and should aim at being good draughtsmen and rapid and accurate arithmeticians.

Engineering is represented in and furthered in the United States and Britain by active and prosperous institutions and societies of engineers, mostly modelled after the London Institution of Civil Engineers, established 1818. The profession, gathering bright and active minds, and demanding science and perseverance, is in high public esteem, and will doubtless increase in importance.

For the more important operations involved in engineering, see BRIDGE: CANAL: AQUEDUCT: DIKE: EMBANKMENT: TUBULAR BRIDGE: ROADS AND ROAD-MAKING: RAILWAYS: RIVER: SUSPENSION BRIDGE: TUNNEL: ETC.

ENGINEERING, MILITARY: the art of designing and constructing fortifications and other military works. The military engineer is an officer in the service of government, whose duties, besides the construction of fortifications, are to make surveys for warlike purposes, and to facilitate the passage of an army by the construction of roads and bridges. He is also often called upon to undertake or supervise many works which more properly belong to the business of the civil engineer, such as the survey of the country and the inspection of great public works.

ENGINEERING, ELECTRICAL: a branch of mechanical engineering that has developed into a separate profession of great importance since the rapid increase in the use of electricity in the last 20 years; it deals with all the problems connected with the development, transmission, and transformation of electrical energies into light, heat, and power.

ENGINEERS' IN THE UNITED STATES NAVY: commissioned non-combatant officers, of the grades of 1st and 2d asst. engineers, passed asst. engineers and chief engineers, having charge of the machinery of steam vessels. Besides being familiar with the management, construction, and erection of nautical steam machinery, they must be skilled mechanics, competent to make and superintend all necessary repairs to engines, boilers, and machinery for operating batteries, in navy-yards, at sea, and in action, and also possess a knowledge of the various properties and powers of steam.

ENGINEERS', UNITED STATES CORPS OF: branch of the military service created by act of congress 1802, Mar. 16, and originally constituting the U. S. Milit. Acad. The act provided that the corps should consist of 1 col., 1 lieut.-col., 2 majors, 4 captains, 4 first lieutenants, 4 second lieutenants, and sufficient cadets to bring the whole num-

ber to 20; that it should be stationed at West Point, N. Y.; and that its entire force should be under the direction of the pres. of the United States. In 1806, Apr., it was provided that the engineers were not to assume, nor be ordered on, any duty beyond their special profession, except by direction of the pres. (63d Art. of War); in 1838, July, the corps was increased from 20 to 47, and a subordinate branch, designated the corps of topographical engineers, was organized; in 1846, May, a company of sappers, miners, and pontoniers was authorized to be formed and attached to the corps; and in 1861 the corps was enlarged by congress and styled the battalion of engineers. The separate corps of togopraphical engineers was abolished 1863 and its officers merged with the corps of engineers. On the reorganization of the army, 1866, the corps was made to consist of 1 chief of engineers, with the rank and pay of a brig.gen., 6 colonels, 12 lieut, colonels, 24 majors, 30 captains, and 26 first and 10 second lieutenants. In 1895 there were also 11 additional second lieutenants, and a battalion of engineers, with a lieut.colonel, 4 captains, a first and 3 second lieutenants, and 10 additional second lieutenants. As the corps originally constituted the Milit. Acad., all the superintendents of that institution were appointed from the corps till the act of 1866, July 13, which threw the office of supt. open to all arms of the service. The corps has special charge of the construction and repair of sea-coast defenses and of the improvements of harbors and rivers authorized by congress. See TOPOGRAPHY, MILITARY.

ENGIS, *ŏn-zhē,* Belgium, an archæological station on the Meuse, southwest of Liège, where a human skull was found imbedded in breccia, with remains of the rhinoceros and reindeer. There has been much discussion among archæologists as to the age of the skull, but it is most commonly referred to the Quaternary Period.

ENGISCOPE, n. *ĕn′jĭ-skōp* [Gr. *engus*, near; *skopeo*, I view, I see]: reflecting microscope, invented by Amici, in which the image is viewed at a side aperture in the tube, in a manner similar to the Newtonian telescope.

ENGLAND, *ĭng′gland:* southern and larger section of the island of Great Britain, and the most important member of the United Kingdom of Great Britain and Ireland. For the geography of England see GREAT BRITAIN. This article sketches its history previous to the union with Scotland.

Of the inhabitants of England before the Christian era, little is known. In some of the ancient geographers, there are a few scattered notices of a rude population, with whom a limited commerce in tin was carried on by the Phœnician merchants; and our information scarcely extends further. For what is known of England under the Roman occupation, see BRITANNIA. For an account of the country during the period between the withdrawal of the Romans and the Norman Conquest, see ANGLO-SAXONS.

ENGLAND.

When William of Normandy landed in England to claim the crown which Edward the Confessor had bequeathed to him, he found that the people had raised to the throne Harold, the son of a popular nobleman. The resources of the Saxons, however, had been wasted in domestic conflicts before the attack of William; and the battle of Hastings (1066) gave England with comparative ease to the Normans. The next 20 years saw the conquest completed, and nearly all the large landed estates of the Saxons pass, on every pretext except the true one, into the hands of the Normans. William claimed, indeed, to rule as sovereign by hereditary right, but this made little difference to the fact of conquest. All the high offices in the state and in the church passed into the hands of a new race. The Danes, alone could retain either property or dignity. For long, some of the Saxons maintained an unequal resistance, retiring to the forests as the outlaws whose adventures furnished the materials for those favorite popular legends, where, as in Robin Hood, the spoiling of the richer classes is depicted as one of the chief virtues. In the course of time, the Normans were absorbed among the Saxons, their very language disappearing, though leaving many traces. From this union arose the English people and the English language as they now exist.

The union of the Normans with the Saxons was not fully effected so long as the Normans retained their foreign possessions. In King John's reign, the whole of these were lost, excepting Guienne and Poitou. Long wars under Henry III. and Edward III., and his famous son, the Black Prince, were continued, in the endeavor to regain the lost possessions; yet great victories like those of Cressy (1346) and Poitiers (1356) seemed to leave no result, for no sooner were the English armies withdrawn, than the populations returned to their French allegiance. After Agincourt (1415), Henry V., when by force he had caused himself to be acknowledged heir to the French throne, was virtually king of France, and held his court in Paris; yet, in a few years more the ride turned, the rebellion of Joan of Arc came, and (1451) nothing of foreign ground was left the English king excepting Calais. England was soon further weakened by the Wars of the Roses (1450–85).

To their efforts to conquer France, the Norman kings added others. Henry II. conquered Ireland (1171), Edward I. conquered Wales (1285), and had almost added Scotland to his dominions. The bravery of Wallace and Bruce defeated the armies of Edward II., his successor (Bánnockburn, 1314); and though the idea of the conquest of Scotland was always a favorite one, an opportunity for attempting it on a great scale never again presented itself.

The great struggles of the successors of William were with the ecclesiastics and with the barons. Sometimes in these the popular sympathies were with, sometimes against the crown. The conqueror himself and his immediate successors had no difficulty in maintaining the superiority of the courts of justice over the ecclesiastics: but even a

England and Wales

Scale of Statute Miles.

0 10 20 30 40 50 60 70 80

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sovereign so bold and skilful as Henry II. was forced, after the outcry occasioned by the murder of Thomas-à-Becket (1170), to yield the point. The right to nominate the higher ecclesiastics also was secured by the popes. The degradation of the English monarchy was at its lowest when King John consented (1213) to hold the crown as a gift from Rome. The weaknesses of this monarch had good as well as evil results: from him the barons won their Great Charter (1215). From Henry II. something similar had already been gained; but it was the Magna Charta of John (1215) which established two great English principles—that no man should suffer arbitrary imprisonment, and that no tax should be imposed without the consent of the council of the nation. Under Edward I., the famous statute that no manner of tax should be imposed without the common consent of the bishops, barons, and burgesses of the realm, was passed (1296); and before the time of Henry VII., the foundations of parlimentary government had been laid.

The union of the houses of York and Lancaster under Henry VII. begins a new period in English history. Part of his reign was disturbed by Perkin Warbeck and other pretenders to the throne, in support of whose claims the turbulent nobles found vent for their restlessness. But the greater part of his long reign was distinguished from preceding reigns as a time of peace and economy. During it, men's minds ripened for the great events of the next reign. Henry VIII. succeeded, under most favorable auspices. He found the alliance of his now important country courted by both of his great contemporaries, Francis I. and Charles V. But the interest of the foreign complications of the reign merges in the struggle between the courts of England and of Rome. The origin of the contest was the divorce which Henry desired to have from Catharine of Aragon, his brother's widow, to whom he had been married by papal license. Cranmer and the English Church pronounced the marriage null, but a formal decree of divorce by the head of the church was then thought necessary in Rom. Cath. Europe. Pope Clement and the consistory, influenced by Spanish counsels, delayed by every possible means, the decision of the question. England, however, was ready enough to support Henry. Wickliffe and his adherents had done not a little to shake the attachment of the nation to a foreign spiritual authority, by preaching doctrines which dispensed with the necessity for it. Parliament met, when the Commons took the significant step of presenting a long memorial of complaints against Rome. The pope still showing no signs of yielding, bills followed, declaring the king the head of the English church; rendering the inferior clergy amenable to the civil courts; abolishing the payment of the first year's fruits of ecclesiastical livings to Rome; and, perhaps more important than any of these, declaring that no convocation should meet unless the king should summon it, and that no ecclesiastical canons should have force except with the

king's consent. To these measures, the pope replied by refusing the divorce, and excommunicating the king (1533). The breach thus became irreparable.

A new act was passed giving to the magistrates the power of judging in questions of heresy. The next step was the suppression (1538) of nearly 400 of the smaller monasteries. The subsidence of an insignificant popular reaction, incited by the lower clergy, was followed by the suppression of the great abbeys. All these changes, however, touched only matters of church government or civil rights. On matters of faith, Henry and his parliaments were as orthodox as the most conservative could wish. They embodied the leading Catholic doctrines, disputed by the Protestants, in an act of parliament, known among the people as 'the bloody six articles,' and enforced conformity under severe penalties.

Henry was succeeded by Edward VI. His reign was marked by the general progress which the Reformation then made from questions of government to questions of doctrine. More thoroughly than ever the power of the clergy was sapped. The Book of Common Prayer (1548) deprived them of the mysterious authority which the use of a foreign language in worship gave them in the eyes of the people, and the 42 Articles of the Church of England (1552), the foundation of the present 39, denied, among other things, their power to work miracles in the elevation of the mass.

The next reign saw the inevitable reaction. The superstitions, or traditional beliefs, of the populace had been too rudely handled, and—as often happens before a crisis—there came a period of physical suffering. The conversion of cornfields into sheep-walks, induced by the high value of wool as an article of export, had thrown many out of employment; and the country was, moreover, infested with the crowd of vagrants whom the monasteries had been wont to maintain. The popular dissatisfaction coupled these things with the Reformation. Thus the opportunity was prepared for the atrocities of the reign of Mary. The queen herself was interested, by her mother's honor and her own, to uphold the Roman faith; and her gloomy temper, aggravated by her unhappy childless marriage, believed that it did true service to God when it gave rein to the bigotry of Pole and Bonner. In her first parliament (1553), the whole legislation of Edward VI. was repealed, leaving the Church of England one in ceremonial and doctrine with the Church of Rome. Another parliament (1555) repealed the legislation of Henry VIII., thus re-establishing the papal supremacy. Everything that the reformers had done was thus undone. Still the adherents of the Reformation were numerous, and when legislation failed to convert them, the fires of Smithfield were tried. Hooper, Bp. of Gloucester, was one of the first to suffer. Latimer, Ridley, Cranmer, followed, and the number who perished was not less than 300 by fire, and 100 by torture and the cruelties of confinement.

Nothing more was needed to turn the popular mind at once and for ever from the Church of Rome.

The accession of the Prot. princess Elizabeth came as a relief to the whole nation. The Rom. Catholics themselves were weary of the policy which made England the tool of Spain, and were sickened with the cruelties which had been enacted. Elizabeth began by releasing from prison all confined on charges of heresy. Parliament followed (1559) with acts restoring the royal supremacy over the church, and returning in general to the legislation of Edward VI. The Prayer-book and the Thirty-nine Articles were adjusted as they still remain. Fortunately for the country, the ministry of Elizabeth, guided by the able hand of Cecil, was one of peace. No opportunity was lost of aiding the Prot. cause throughout Europe; but Elizabeth had almost no open wars, and her long reign was disturbed by almost no domestic collisions. The mistake committed in detaining the queen of Scotland in an English prison, gave a constant incitement to disaffection among the adherents of the old faith, but no serious consequences ensued. Mary was executed 1587. Toward the close of the reign, Prot. and Rom. Cath. were alike patriotic in repelling the Armada (1588). At the death of Elizabeth, the crowns of England and Scotland were united.

The reign of James I. presents little that is remarkable. He was the first 'King of Great Britain'—so styled 1604. The plot, for which Sir Walter Raleigh suffered long afterward, and the Gunpowder Plot—the insignificant proportions of which were magnified for factious purpose—disturbed the earlier years; and the close of the reign found the nation engaged in an unfortunate war to assist the king's son-in-law, Frederick, Elector of Bohemia, against Emperor Ferdinand II. of Germany. But for the greater portion of the 23 years of the reign, there was neither foreign nor domestic war. These years the king occupied industriously in rendering monarchy odious and contemptible. He lavished money upon unworthy favorites, and to supply his extravagance, openly sold the dignities of the peerage and the other honors of the state. His personal demeanor was vain, weak, and ridiculous; but in contrast with the insignificance of his talents was his extravagant conception of the extent of his royal prerogative. His conduct occasioned great discontent in parliament, and but for his timidity, might have led to more serious consequences.

The misfortunes of Charles I. were the legitimate result of the principles of his father. Charles committed the mistake of repeating, in the 17th c., acts which the Plantagenet sovereigns had done with impunity in the 14th and 15th. One of his first acts was to exact a benevolence to carry on the war with Spain. Had the war been successful, this might have been overlooked, but when the bad management of the Duke of Buckingham lost the fleet off Rochelle, the indignation of the Commons was without bounds. In place of taking measures to allay this feeling,

the king dissolved the parliament, and resolved to govern without calling another. In 1630, he concluded peace, and for the next seven years, in council with Strafford and Laud, he carried on the government. Taxes were raised as before without parliamentary authority; and when the taxes failed, money was raised by selling to the Rom. Catholics immunities from the penal laws against their worship. The chief incidents of this period were Hampden's trial regarding stupmoney, 1637, and the attempted arrest of five members of Parliament, 1642. In 1637, when the king found himself involved in a war with Scotland, in consequence of his endeavor to introduce a liturgy there, he was compelled to call a parliament. The Commons refused supplies, and were again dissolved. In 1640, the king once more summoned a parliament. He found the temper of the house more indomitable than ever. In place of voting him supplies, they impeached his minister Strafford, and condemned him to death (1641). The Commons then presented a grand remonstrance to the king, embodying all the grievances the nation had suffered since the death of Elizabeth. Matters proceeded from bad to worse, till an open rupture came, and an appeal was made to arms. In 1642, Aug. the king erected his standard at Nottingham, while the rebels took arms under the Earl of Essex. The first conflict was at Worcester when Prince Rupert won a Royalist success; the second was at Edgehill, where the loss on both sides was severe and nearly equal. During the ensuing struggle Oliver Cromwell was the organizer of Roundhead victory or determined effort, although the fortune of war continued to vary, till at Marston Moor it turned against Charles, and at Naseby, 1645, June, he was finally defeated. After trial and condemnation, he was put to death 1649, Jan. 30.

The government for the next four years was conducted by parliament. Meanwhile, Cromwell was rising into distinction, and power gradually fell from the hands of parliament into those of the military. In 1653, Cromwell was proclaimed 'Protector.' He was now absolute monarch. He governed with a firm hand, and never was England more respected abroad than during his time. In 1654, he concluded peace with Holland, and employed the gallant Admiral Blake in an expedition aganist the Spaniards, which ended brilliantly for the English navy. But the nation grew as discontented with the government of Cromwell as it had been with that of Charles. After the death of the Protector, 1658, and a short interval during which his son Richard held the office, parliament received with acclamations a proposal from Charles II. to return. In 1660, May, the populace clamored with delight on the royal entry to London of him who, a few years before, had fled from Worcester for his life.

While Clarendon was minister, the government of Charles II. was well conducted. A war with Holland was brought to a successful ending in the conquest of New York from the Dutch. On Clarendon's resignation 1667, the govern-

ment passed into the hands of the ministry known as the Cabal. They were as profligate and as careless as the king himself. A succession of cruelties against the Rom. Catholics, for which the pretended revelations of Titus Oates and his imitators furnished the excuse, betokened rather the wanton temper of the sovereign and the nation, than any zeal for Protestantism. The only act which reflects much credit on any portion of the reign was the passing, 1679, of the *Habeas Corpus* Act, designed more effectually to protect the liberty of the person. Strong efforts were made in parliament after that to pass the Exclusion Bill, the object of which was to exclude the Duke of York, as a Rom. Catholic, from the succession. To the great satisfaction of the king, parliament rejected the bill. In 1681, parliament was dissolved, and Charles II. never called another.

After this there was a change for the worse in the character of the government; from being wantonly indifferent, it became sullenly mischievous. Presbyterians and Nonconformists were excluded from all offices. Among other arbitrary acts, was the recall of the charters of London and many of the other principal cities, which were restored, with diminished privileges, only on payment of heavy fines. Conduct such as this made men more than ever afraid of the succession of the king's brother, who was supposed to be the instigator of this policy. A conspiracy (the Rye-House plot) to secure the succession to the Duke of Monmouth, an illegitimate son of the king, was formed. Lord Howard betrayed the conspiracy, and among others who suffered death for it were Lord Russell and Algernon Sidney.

When the king died, 1685, James II. succeeded amid universal dissatisfaction followed by rebellion. Monmouth's attempt to seize the throne, however, was mismanaged, and failed. The punishment of those who had aided his rising formed an occasion for the perpetration of great cruelties by Jeffreys, then chief justice of England. In the meantime, nothing could be fairer than the king's language. He issued a declaration in favor of general toleration, and announced that the penal laws against Rom. Catholics were no longer to be enforced. A second declaration to the same effect was issued, but he went further, and added to it an order that the clergy should read it in all churches. The Abp. of Canterbury and six bishops presented an address to the throne, humbly setting forth that their duty to maintain the Prot. establishment would not permit them to give obedience to the royal mandate. For this they were indicated as guilty of sedition. The trial of the bishops (1688) was the turning-point in James' career. It created immense excitement, and when the jury returned a verdict of not guilty, even the soldiers joined in the tumultuous rejoicings.

William, Prince of Orange, who had married Mary, the eldest daughter of the king, had long been intriguing with the malcontents. He now landed in England with a small

body of troops. The soldiers, the leading nobles, even the king's own children, joining the prince, the king fled to France. Parliament then settled the crown jointly on William and Mary for life. James with the assistance of Louis XIV., made one effort to regain his throne. He landed in Ireland, where the lord lieut., Tyrconnel, was devoted to his cause, and managed to raise an army. William defeated him, 1690, at the battle of the Boyne; and the contest was soon terminated by the second flight of James to France. So easily was the great revolution of 1688 effected.

The domestic government of William was marked by his efforts to introduce a general toleration; but as to his foreign administration, which led the country into costly wars, there are differences of opinion. To reduce the threatening power of France, England, in alliance with Holland and Germany, embarked in a protracted contest. Its termination at the peace of Ryswick, 1697, certainly brought to England an increase of reputation and territory. William died 1702.

Under Queen Anne, the war with France was renewed, and the Duke of Marlborough's splendid victories of Oudenarde, Blenheim, and Ramilies were achieved. With these the history of England as a separate state closes. In 1707, the long-wished-for union with Scotland was accomplished; and since that, Great Britain, united under one legislature, as well as under one crown, has a common history. For bibliography see article GREAT BRITAIN.

A table of the English sovereigns is appended, beginning with Alfred, and continued, for convenience, to the present time:

	Began to Reign.	Years of Reign.
ANGLO SAXON LINE.		
Alfred, king of Wessex	871	30
Edward I., king of Wessex, Mercia, etc	901	24
Athelstan, king of England	925	15
Edmund I	940	6
Edred	946	9
Edwy	955	4
Edgar	959	16
Edward II	975	3
Ethelred	978	38
Edmund II	1016	1
DANISH LINE.		
Canute	1017	19
Harold I	1036	3
Hardicanute	1039	2
SAXON LINE.		
Edward III	1041	25
Harold II	1066	
NORMAN LINE.		
William I	1066	21
William II	1087	13
Henry I	1100	35
HOUSE OF BLOIS.		
Stephen	1135	19
PLANTAGENET LINE.		
Henry II	1154	35
Richard I	1189	10
John	1199	17

	Began to Reign.	Years of Reign.
PLANTAGENET LINE.		
Henry III.	1216	56
Edward I.	1272	35
Edward II.	1307	20
Edward III.	1327	50
Richard II.	1377	22
HOUSE OF LANCASTER.		
Henry IV.	1399	14
Henry V.	1413	9
Henry VI.	1422	39
HOUSE OF YORK.		
Edward IV.	1461	22
Edward V.	1483	
Richard III.	1483	2
HOUSE OF TUDOR.		
Henry VII.	1485	24
Henry VIII.	1509	38
Edward VI.	1547	6
Mary.	1553	5
Elizabeth.	1558	45
STUART LINE.		
James I.	1603	22
Charles I.	1625	24
COMMONWEALTH.	1649	10
STUART LINE.		
Charles II.	1660	25
James II.	1685	3
HOUSE OF ORANGE.		
William and Mary.	1688	14
STUART LINE.		
Anne.	1702	12
BRUNSWICK LINE.		
George I.	1714	13
George II.	1727	33
George III.	1760	60
George IV.	1820	10
William IV.	1830	7
Victoria.	1837	64
Edward VII	1901	

ENG'LAND, CHURCH OF: the Episcopal Church as established in England. For the origin and early history, and an outline of the doctrines and form of government of this church, see ANGLO-CATHOLIC CHURCH; see also AUGUSTINE: DUNSTAN. Till the time of the Reformation, ecclesiastical affairs would be more properly described as the history of the Church *in* England; from that period the Church *of* England dates her existence. She, however, retains so much of antiquity, and her institutions, laws, and formularies are so interwoven with the history of the past, that it would be impossible to have any correct or connected view of them, and of her *connection with the state*, her characteristic feature, without glancing at the leading events between the Conquest and the Reign of Henry VIII. During the three centuries from the Norman Conquest (1066) to the preaching of Wickliffe (1356), her history can be regarded only as a continual struggle between the ecclesiastical and civil power, and there would be little else to describe than the methods by which the mitre triumphed over the crown, and the crown invaded the rights and property of the church. In the time of William I., nearly half the country was in the hands of 'spiritual' persons. He ejected

the English clergy, and supplanted them with Normans; and though he was possessed of full power over the church, yet in his reign were sown the seeds of future papal encroachments. Papal legates were then first introduced into England, and the ecclesiastical courts separated from the civil. From this time, the increased influence of Rome may be traced to the defective titles, the usurpations and the violent conduct of the kings. Thus, the defective title of Henry I. made him seek popularity by recalling the primate Anselm, who had incurred the displeasure of his brother William, and had fled the country. Anselm was devoted to the pope, who had espoused his quarrel; and he refused to do homage to the king for the temporalities of his see, till at length Henry found himself obliged to surrender the right of *Investiture*. Thus, too, Stephen's usurpation opened the way for further encroachments; and Henry II., who found the power of Rome greatly augmented, helped to extend it, by accepting a grant of Ireland from the pope. Then followed the opposition of Thomas-à-Becket, which arose out of the question of the punishment of ecclesiastics by the civil power. For the moment, it seemed that the quarrel was healed by the *Constitutions* agreed on at Clarendon (q.v.), but it broke out more violently than ever. The pope discharged Becket from his oath, and condemned the Constitutions. Becket had fled from the kingdom; and his subsequent return, murder, and canonization, all tended to strengthen the authority of the church. It was not, however, till the reign of John, when England was laid under an interdict, and the king resigned his crown to the pope, that the papal encroachments rose to their height; and the weak reign of Henry III., which followed, did nothing to abate them. Edward I. gave a check to the power of the clergy, subjected them to taxation, and passed the statute of Mortmain (1279), which prohibited the transfer of land without the king's consent. There is little to be said as to innovations in doctrine during these three centuries; but it may be noted, that about the middle of this period, 1213, the council of St. John Lateran declared transubstantiation or the bodily presence of Christ in the consecrated elements, a tenet of the church.

In 1356 a new period commenced. Wickliffe then published his first work, entitled *The Last Age of the Church*. His doctrines correspond in many points with those now taught by the Church of England, but he differed from her in regard to the necessity of Episcopacy, which he rejected; he believed also in purgatory, and enjoined prayers for the dead. His chief objects of attack were the papal indulgences and the doctrine of transubstantiation. An English writer has observed, concerning the condemnation at Oxford of Wickliffe's opinions with respect to the latter, that 'this was the first plenary determination of the Church of England in the case, so that this doctrine, which brought so many to the stake, had with us but 140 years' prescription before the times of Martin Luther.' In a limited

sense he upheld the efficacy of the seven sacraments. Wickliffe had a large body of followers. They were called *Lollards*, probably from a German word, *lullen*, to sing with a low voice. The storm of persecution, which he escaped by death, fell upon them. Henry IV. thought it necessary to fortify his usurped position by assisting the bishops against the Lollards; and from this time to the Reformation, there was an uninterrupted succession of confessors and martyrs. Sir John Oldcastle, Lord Cobham, was the most illustrious of these sufferers. Fox gives a detailed account of nearly 20 persons burned for heresy between the death of Lord Cobham and 1509, when Henry VIII. ascended the throne. To some extent, the blood of these martyrs was the seed of the Reformed Church; but we must not overlook the 'hidden seed' which was growing secretly, from the time that Wickliffe gave his countrymen a translation of the Scriptures in their own tongue. The progress of learning, and especially the study of Greek, led to a better understanding of the sacred books, while the invention of printing (1442) caused a wider circulation of them.

The above causes, however, would probably have proved insufficient to produce the great change then impending, had not Henry VIII.'s divorce from Catharine of Spain led to a quarrel between him and the pope, which ended in the total abolition of the papal authority within the kingdom. Then began the Reformation (q.v.) in earnest. For the details of that great event see that title, and the lives of such men as Wolsey, Sir Thomas More, Fisher, Clement, Luther, Cromwell, Cranmer, Latimer, and Ridley, etc. From this period may be dated the existence of the Church of England as a separate body, and her final separation from Rome. For the opinions of the church in Henry's reign, two important books, which were then published should be consulted—viz., the *Bishop's Book*, or the *Godly and Pious Institution of a Christian Man*, and the *King's Book*, a republication of the same in a more perfect form, 1543, entitled, *The Necessary Erudition for any Christian Man*, and called the *King's Book* because put forth by royal authority. A book of *Articles devised by the Kinges Highnes Majestie to stablyshe Christen Unitie*, also should be consulted. It has been stated (see ANGLO-CATHOLIC CHURCH) that the reformation in *doctrine* did not make much progress in Henry's reign; from these books, it will be seen that it was rather retrograde. The monks, too, who were dispossessed at the dissolution of the monasteries, were dispersed among local cures, and kept alive the old opinions, and the lower orders were not as yet favorable to the new doctrines. Cranmer was the leader and presiding genius of the Reformed opinions; and the youth of Edward VI. left the king pliant in the hands of the archbishop. The Book of Homilies, put forth 1540, the New Communion Service and Catechism, 1548, the first Book of Common Prayer, 1549, and the Forty-two Articles, 1553, all bear the impress of his hand, and it was

these which advanced and fixed the doctrines of the Reformation. Nor was the temporal authority idle on the same side—Bonner and Gardiner were committed to prison and both were deprived of their bishoprics. In fact, the way in which all the institutions of the Church of England were established in Edward VI.'s reign by the help of the civil magistrate, have brought upon her the charge of Erastianism. The civil power had just delivered her from a foreign tyranny; and when the young king's lack of health, the known sentiments of his successor Mary, the ignorance of the common people, and the interested views of the old clergy, are considered, it cannot be a matter of surprise, still less of blame, that the same arm was relied upon for the establishment of the new forms of religion.

Although Mary promised at her accession that she would put constraint on no person's religion, her promise was broken. Bonner and Gardiner were restored; the Book of Common Prayer and Catechism were declared heretical; the kingdom was reconciled to the see of Rome; a persecution of the chief reformers commenced—Rogers was burned at Smithfield, Hooper at Gloucester, Saunders at Coventry, Taylor at Hadley. The prisons were filled with 'heretics;' many fled beyond sea; some purchased safety by an outward conformity. Cranmer, Latimer, and Ridley perished in the flames at Oxford. Cardinal Pole was made primate. One benefit was conferred on the church by Mary—she surrendered all the church lands, as well as the first fruits and tenths, which had been seized by Henry. At last the death of Mary, with which that of the cardinal was nearly simultaneous, delivered the church, from its oppressors. The passing of the *Act of Uniformity* in the first year of Elizabeth's reign, restored the Common Prayer-book to general use, and enjoined the same dresses as were in use at the time of the first Prayer-book of Edward VI. All the bishops except one, Kitchin of Llandaff, refused to take the oath of uniformity, and were ejected from their sees to the number of 14 (the 11 remaining sees were vacant by deaths), and 175 other beneficed clergy were deprived for the same cause—no very considerable number, when it is remembered that there were then 9,400 benefices in England. There was some difficulty in filling up the vacant bishoprics, and perhaps some slight informalities. Matthew Parker was made abp. of Canterbury. In 1562, the Thirty-nine Articles were finally reviewed and subscribed. These, with the Book of Common Prayer, are commonly regarded as the tests of orthodoxy in the Church of England.

But what was done to satisfy the scruples of Protestant nonconformists? An attempt in this direction was made in the reign of James I. at the Hampton Court Conference (q.v.). The result was another review of the Common Prayer-book; and this, with the new translation of the Bible, and the passing of the canons of 1604, were the principal ecclesiastical events of James's reign. These canons received the sanction of the crown, but not that of

parliament; they are not, therefore, binding on the laity, but they are still binding on the clergy to some extent, and they regulate the practice of the ecclesiastical courts, and are the only rule, on some points, to which the bishops and clergy can appeal. See LAUD; SCOTLAND, CHURCH OF, for the events of Charles I.'s reign. The great rebellion overthrew both church and state. The bishops were declared 'delinquents,' robbed of their property, and abolished; and the clergy were ejected from their benefices. Laud was put to death 1645. The Church of England had no corporate existence during this interval. With the restoration of the monarchy, 1660, came the restoration of the church. The reaction from Puritanism to Prelacy was complete. Attempts were made, but with small success, to win over the Puritan leaders; bishoprics were offered to Baxter, Calamy, and Reynolds; but only the last was accepted. The Savoy Conference (q.v.) was an unsuccessful, perhaps insincere, attempt to comprehend the noncomformists in the Established Church. But the demands of the Presbyterians were most immoderate. Baxter went so far as to propose the substitution of an entirely new book of his own hasty composition, in the place of the Common Prayer-book. After the failure of the Savoy Conference, this book was once more reviewed; and a new Act of Uniformity, 1662, made its use, as it now stands, compulsory in all the churches.

The Church of England passed through one more critical period before reaching that tranquillity in which, for upward of a century, she slumbered too securely. In 1687, James II. published the famous Declaration of Indulgence, which filled up the measure of popular discontent, and finally cost him his crown. Although by this declaration, which was perfectly illegal, liberty of conscience was permitted to all his subjects, it was clearly understood that the liberty was intended only for the papists. The nonconformists refused to accept the treacherous boon. Eighteen bishops out of twenty-five refused to publish the declaration, as ordered, in their dioceses. Seven of them —Sancroft, Lloyd, Ken, Turner, Lake, White, and Trelawny—drew up a remonstrance to the king; they were summoned before the privy-council, and sent to the Tower. The whole city was in commotion; and great was the rejoicing when, on being brought to trial in Westminster Hall, they were acquitted. On Nov. 5 following (1688) the Prince of Orange landed in England. It is worthy of remark, that out of these seven bishops three refused to swear allegiance to him, and were joined by a considerable number of the clergy; these were called Nonjurors. In the first year of William and Mary's reign, the Toleration Act was passed, and dissent ceased to be illegal. Another attempt was made to comprehend the noncomformists in the church, but the lower house of convocation was in no tolerant mood, and the attempt failed, but chiefly in consequence of the disturbances in Scotland. In 1717, convocation was dissolved. After slumbering for nearly 140

years, it was once more called into life and action in the province of Canterbury, 1853, under the ministry of the Earl of Aberdeen, and a few years later the Convocation of York also took advantage of the liberty accorded by the crown on the advice of this government. See CONVOCATION.

That the Church of England, after fighting for its very existence against popery on the one hand, and against Puritanism on the other, should have subsided into inactivity during the dull reigns of the Georges, is less a matter of surprise than of regret. The peaceful enjoyment of her temporalities in a dull, irreligious, not to say infidel age, may easily account for, though it cannot excuse, her idleness. But that in the rise of John Wesley, 1730, she should have failed to see a grand opportunity for herself, is a matter of both surprise and regret; she, however, let it pass. Such opportunities are rare in history. The next important event in the history of the church is the Act of Union, which came into effect, 1801, Jan. 1, uniting the Churches of England and Ireland in all matters of doctrine, worship, and discipline. The Reformation had made some progress in Ireland under Edward VI. Five Prot. bishops were appointed 1550, and the English Bible and Liturgy were introduced 1551; but from a variety of causes the Reformed doctrines have never found much acceptance with the native population; and though a Prot. Church was established by law, it was always the church of the minority (see IRELAND). In 1635 the English Articles were received; and in 1662, the English Book of Common Prayer was adopted by convocation. Before the political union of the countries, the two churches were in full communion. By an act of the imperial parliament, 1833, ten of the Irish bishoprics were suppressed, and the funds thus obtained were applied to the augmentation of small livings and the building and repair of churches. There are now 12 Irish bishops. But in 1869, the Irish Church was disestablished and disendowed; and this branch of the Anglican community now stands in much the same relation to the Church of England as does the Episcopal Church in Scotland.

In later times, three great controversies have shaken the English Church, which have led to some great reforms, some internal divisions, and the secession of some members to Rome, and of a few to the ranks of dissent. Those were the Tractarian, the Gorham, and the Essays-and-Reviews controversies. The first was occasioned by some Tracts whose publication began at Oxford 1833, with the object of reviving something of the spirit of catholic antiquity, and reforming the abuses and slovenly practices which had crept into every part of the church system (see TRACTARIANISM). The Gorham Controversy (q.v.) related to the doctrine of baptismal regeneration. The Tractarians are accused of Romanizing tendencies; and their views, when carried to extremes, undoubtedly lead in that direction, as is proved by the numerous secessions to that

church. With the extreme Low Church party, Episcopacy is rather an expedient than a necessary form of church government. They think little of the efficacy of sacraments, in their outward form, and deny that regeneration necessarily takes place in infant baptism. Justification by faith, the atonement of the cross, and doctrines of at least a Calvinistic tinge on election, are their leading topics in preaching. See SIMEON; VENN.

The Essays-and-Reviews controversy (so called from a book thus named) concerned what are called Broad Church views, attributed to men of the Thomas Arnold school, and the followers of Mr. Maurice (q.v.). Those who hold them can scarcely be called a party, and are, indeed, unwilling to be so considered; but if their position must be defined, they might be described as a party between, and somewhat antagonistic to, both the High and Low Church parties. The High Church party insist on the authority of the church and priesthood, the efficacy of sacraments when rightly received, and the necessity of apostolical succession in the matter of orders, and in their general teaching they take the Prayer-book as the exponent of Scripture. They are scrupulous in observing the rubrics, and have done much to revive the practice of daily prayer in the churches, and the observance of the festivals. Order, unity, antiquity, and catholicity are what they profess to have in view. See RITUALISM.

In 1906 there were 2 abps.; 35 bps.; 32 suffragan bps.; 32 deans; 95 arch-deacons; 810 rural deans. In 1905 there were 14,029 beneficed clergy; 7,500 curates and unbeneficed clergy; 7,182,253 church sittings; 39 dioceses. There were 12,000 voluntary Church of England schools (1906) with accommodation for 2,700,000 pupils. The abps. and 24 bps. have seats in the house of lords. The revenues of the church from endowments in tithes, land, etc., amount to between $20,000,000 and $30,000,000 annually; and the amount annually raised by voluntary means averages, for church building and restoration, $7,000,000; foreign missions, $3,700,000; elementary education $2,640,000; home missions, clubs, charities, $6,500,000; and for the support of the poor $3,000,000. In 1905 the revenue was £5,546,028, and revenue for missions, etc. £2,290,247. The voluntary contributions for church work amounted to over £8,000,000. For administrative and supervising purposes the country is divided into two provinces, presided over by abps.; these are subdivided into dioceses with a bp. for each; the dioceses are divided into archdeaconries with an archdeacon for each; the archdeaconries comprise the rural deaneries; and these are subdivided into parishes, in charge of the minor clergy. The church govt. is by bps., priests, and deacons. The cathedrals, prelates, and date of their preferment are (1906): Canterbury, Davidson, 1903; York, Maclagan, 1891; London, Winnington-Ingram, 1901; Durham, Moule, 1901; Winchester, Ryle, 1903; Bangor, Williams, 1899; Bath and

Wells, Kennion, 1894; Bristol, Browne, 1897; Carlisle, Diggle, 1904; Chester, Jayne, 1888; Chichester, Wilberforce, 1895; Ely, Chase, 1905; Exeter, Robertson, 1903; Gloucester, Gibson, 1905; Lichfield, Legge, 1891; Lincoln, King, 1885; Liverpool, Chavasse, 1900; Llandaff, Hughes, 1905; Manchester, Knox, 1903; Newcastle, Lloyd, 1903; Norwich, Sheepshanks, 1893; Oxford, Paget, 1901; Peterboro, Carr-Glyn, 1896; Ripon, Carpenter, 1884; Rochester, Harmer, 1905; St. Alban's, Jacob, 1903; St. Asaph, Edwards, 1889; St. David's, Owen, 1897; Salisbury, Wordsworth, 1885; Sodar and Man, Straton, 1892; Southwell, Hoskyns, 1904; Truro, Stubbs, 1906; Wakefield, Eden, 1897; Worcester, Yeatman-Biggs, 1904; Birmingham, Gore, 1904; and Southwark, Talbot, 1905.

The patronage of the church is in a great variety of hands—in the crown, the bishops, the nobles, and gentry, and incorporate bodies such as colleges and cathedrals. Advowsons and next presentations may be sold as property, but a presentation may not be sold when a living is vacant. A clergyman is 'presented' to his living by the patron; he is admitted and inducted by the bishop or his appointee; he must 'read himself in,' i.e., he must read the Thirty-nine Articles after the morning or evening prayer within two months after induction. The bishop may refuse institution on the ground of false doctrine or immorality; but an appeal lies to the Arches Court and the Head Court of Appeal.

The Episcopal Church in Scotland is not, politically speaking, in union with that of England. But an act of parliament, 1864, has taken away many restrictions imposed on Scottish Episcopalians after the battle of Culloden; and clergy ordained by Scotch bishops may now, under some slight restrictions, be presented to benefices in England. Events connected with the colonies have also drawn these two communions into closer alliance; and some bishops, selected by English authorities for foreign parts, have been consecrated in Scotland.

Consult the works on the history of the Church of England by Dixon, Molesworth, Hoare, J. H. Blunt, J. J. Blunt, Perry and Short, Marsden and Hardwick; also Fuller's *Church History*, Collier, Strype, Mosheim, Burnet, and Clarendon. Among the great divines whose works should be consulted for further information regarding the views of the church, are Barrow, Pearson, Hooker, Jeremy Taylor, Lightfoot, Hammond, Sancroft, South, Tillotson, Bp. Butler, Atterbury, Bull, Sherlock, and others. See Episcopacy: Episcopal Church, Protestant.

ENGLAND, Free Church of: see Free Church of England: also, Episcopal Church, Reformed.

ENGLAND, *ĭng'gland*, John, d.d.: 1786, Sep. 23—1842, Apr. 11; b. Cork, Ireland: Rom. Cath. bp. He studied law two years, entered the Rom. Cath. Theol. College at Carlow 1803, founded an asylum for unprotected females, and several free schools for the education of poor boys, and was recalled by his bp. and appointed pres. of the

theol. seminary at Cork 1808. Subsequently he became lecturer at the North Chapel, chaplain of the prisons, and proprietor and editor of the *Chronicle*. He was consecrated first bp. of the see of Charleston (S. C.) in Cork 1820, and entered on his duties the same year; founded the *Catholic Miscellany*, the first Rom. Cath. journal in the United States, established a classical school for training a body of missionaries for his large see (N. C., S. C., Ga.); reopened the College of Charleston; established Ursuline schools and orphan asylums, boarding schools, and free schools under charge of the Sisters of Our Lady of Mercy; convened the first provincial council of Rom. Cath. prelates in the United States; and was the first Rom. Cath. clergyman invited by congress to preach in its hall. He was well esteemed by those of other communions than his own.

ENGLAND, NEW: see NEW ENGLAND.

ENGLEWOOD, *ĕng'gel-wud:* a city in Bergen co., N. J., on a branch of the Erie railroad, 12 m. n. of Jersey City. It is an attractive residential suburb of New York city, overlooking the Hackensack valley and built on the western slope of the Palisades, 1 mile from the Hudson river. Englewood is conveniently reached from 129th st., New York city, by ferry to Fort Lee, and by electric cars; and is a fashionable summer resort for the various club and athletic facilities afforded. Incorporated as a village in 1860, it was set off from Hackensack in 1871, and received a city charter in 1896. Englewood is governed by a mayor who holds office for two years, and by a council. Englewood is noted for its handsome residences and fine churches, and has a subscription library, classical institute, hospital, and summer homes for working girls. Pop. (1900) 6,253; (1910) 9,924.

ENGLISH, *ĭng'glĭsh:* first part in several geographical names.—ENGLISH COVE, bay of the Pacific Ocean, on the s.w. coast of New Ireland, lat. 4° 54′ s., and long. 152° 35′ e.—ENGLISH HARBOR, on the s. side of Antigua: one of the best havens in the W. Indies; lat. 17° 3′ n., and long. 61° 45′ w.—ENGLISH HARBOR, on the Pacific shore of Costa Rica, Central America; lat. 8° 50′ n. and long. 83° 55′ w.—ENGLISH RIVER, estuary in Africa, on the w. side of Delagoa Bay, an inlet of the Indian Ocean; about lat. 25° 58′ s., and long. 32° 36′ e.—ENGLISH RIVER: see CHURCHILL RIVER.

ENGLISH, a. *ĭng'glĭsh* [AS. *ĕnglisç*—from *Angles* or *Engles*, an anc. tribe of Germans who settled in England]: of or pertaining to England: N. the people of England and its language: V. to translate into the English language. EN'GLISHED, pp. *-glĭsht.* EN'GLISHRY, n. *-rĭ*, state or privilege of being an Englishman; in *anc. laws*, called *Engleshery, Englyschery, etc. Note.*—The ANGLES came from the s.e. of Sleswick, Denmark—the majority of the settlers in Britain were from *Anglen* or *Angeln* (see ANGLES), and neighborhood, hence *Engla-*

land: AS. *enge*, narrow, as descriptive of the isthmus between Denmark and the Continent: see ANGLO-SAXON LANGUAGE AND LITERATURE: ANGLO SAXONS: ENGLISH LANGUAGE: ENGLISH LITERATURE.

ENGLISH, EARL: naval officer; b. Crosswicks, N. J., 1824, Feb. 18—1893, July 16. Was appointed a midshipman in the U. S. navy 1840, and after a cruise of 4 years round the world entered the Naval Acad., from which he graduated 1846. During the Mexican war he was on duty on the Pacific coast, and was present at the capture of Mazatlan, 1847. He was afterward engaged in deep-sea soundings in the Atlantic, on board the *Dolphin*, and was in the China war 1857, when he was wounded. In 1862 he was promoted lieut.commander, and during the greater part of the civil war was on duty in the Gulf of Mexico, and commanded, at different periods, the *Somerset*, *Sagamore*, and *Wyalusing*. He was promoted commander 1866, capt. 1871, commodore 1880, and rear-admiral 1884, and was retired 1886. In 1868 he gave refuge to the defeated Tycoon of Japan on the *Iroquois* at Osaka.

ENGLISH, JAMES EDWARD: 1812, Mar. 13—1890, Mar. 2; statesman; b. New Haven, Conn. His education was only that of the common schools, and for a time he was apprenticed to a carpenter, from which position he rose to be a master-builder; then engaged in the lumber trade and other lines of business until he became one of the wealthiest men in Conn. From 1848, he held a number of official positions in the state; and was elected to congress as a war democrat, serving 1861–65. He was elected U. S. senator 1875, to fill a vacancy, and was gov. of Conn. three times.

ENGLISH, *ĭng'glĭsh*, THOMAS DUNN, poet: b. Phila. 1819, June 29; d. 1902, April 1. Graduated at the medical dept. of the Univ. of Pa. 1839, studied law and was admitted to the bar 1842, became editor of a daily newspaper in N. Y. 1844, lived in Va. 1852–58, and settled in N. J., 1859, where he afterward practiced law, medicine, and journalism, and served in the legislature. He was author of numerous novels, more than 20 dramas, and many poetical, satirical, and literary works. His best known poem is the song *Ben Bolt* (1843), and his latest works are *American Ballads* (1882), and *Book of Battle Lyrics* (1886). He received the degree LL.D. from William and Mary College 1876, and was in congress 1891–5.

ENGLISH, WILLIAM HAYDEN: 1822, Aug. 27—1896, Feb. 7; lawyer; b. Lexington, Scott co., Ind.; son of Elisha G. English, a pioneer. After passing through the common schools, he finished his education at Hanover Coll., studied law, and was admitted to the bar and to practice in the U. S. supreme court before he was 23 years old. Prior to this he had been deputy clerk of Scott co., and postmaster of Lexington, and at the age of 21 he was a principal clerk in the state house of representatives. He was sec. of the state convention of 1850, which framed the constitution of Ind., and after its adoption (1851) was

a member of the first house of representatives. During Polk's administration, English was a clerk in the U. S. treas. dept., and in 1850 a clerk in the U. S. senate. He served in congress as a democrat 1853–61, and also as a regent of the Smithsonian Inst., Washington. In 1880, he received the unanimous nomination of the Democratic national convention for vice-president, on the ticket with Gen. Hancock.

ENG'LISH (or BRITISH) CHAN'NEL (*La Manche* or the *Sleeve* of the French, and the *Oceanus Britannicus* of the Romans): narrow sea which separates England and France, having on the n. the English counties Kent, Sussex, Hants, Dorset, Devon, and Cornwall; and on the s. the French depts. Pas de Calais, Somme Seine Inférieure, Calvados, Manche, Ille-et-Vilaine, Côtes du Nord, and Finisterre. On the e. it joins the North Sea, at the Strait of Dover, where it is narrowest, being only 21 m. wide from Dover to Cape Grisnez near Calais. From this strait its course is w.s.w. for 280 m. joining the Atlantic Ocean at the Chops, with a breadth of 100 m. between the Scilly Isles and Ushant Isle. With an average breadth of 70 m., it is 90 m. wide from Brighton to Havre; 60 m. from Portland Point to Cape La Hague; 140 m.—its greatest breadth—from Sidmouth to St. Malo; and 100 to 110 m. w. of the latter line. It occupies 23,900 sq. geographical miles, and includes the Scilly Isles, Channel Isles, Ushant Isle, Isle of Wight, and many islets and rocks, especially off the coast of Bretagne. It is shallowest at the Strait of Dover, where a chalk-ridge at the depth of 12 to 30 fathoms extends from the English to the French shore. West of this, it deepens to 60 fathoms, with some banks at 3 to 5 fathoms, and some hollows 5 to 39 fathoms deeper than the parts around. A coarse gravel covers the bottom. The English coast-line of the English Channel is 390 m. long, with an inshore depth of 12 to 55 fathoms, and the French coast line of the English Channel is 570 m. long. Westerly winds prevail in the English Channel and the current, though imperceptible, is always from west to east. The English Channel abounds in fish, of which the chief are pilchard, mackerel, and oysters.

ENG'LISH COLLEGE AT ROME: an ancient institute in the papal city, founded in the 8th century. Later the hostel connected with the college was abandoned, and in 1380 a new hostel was built and liberally endowed, chiefly by rich London merchants, for free entertainment of Englishmen visiting the Holy See. In the reign of Elizabeth the institution was transformed into a seminary for the education of aspirants to the priesthood who proposed to serve in the English mission, which they entered with pretty fair assurance of the martyr's crown. The college was plundered and wrecked by the French republican army 1798 and its resources dissipated; it was resuscitated 1818.

ENG'LISH CONSTITU'TION: see PARLIAMENT.

ENG'LISH DRAM'A: see DRAMA.

ENG'LISH LAN'GUAGE: originating in England, now spoken by abt. 100,000,000 of the earth's inhabitants, and extending in the area of its use. In its vocabulary it is one of the most heterogeneous that ever existed; a fact whose causes are traceable in the history of England (q v.). Its composition and grammatical character are thus described by M. Müller, *Lectures on the Science of Language* (1861). 'There is, perhaps, no language so full of words evidently derived from the most distant sources as English. Every country of the globe seems to have brought some of its verbal manufactures to the intellectual market of England. Latin, Greek, Hebrew, Celtic, Saxon, Danish, French, Spanish, Italian, German—nay, even Hindustani, Malay, and Chinese words—lie mixed together in the English dictionary. On the evidence of words alone, it would be impossible to classify English with any other of the established stocks and stems of human speech. Leaving out of consideration the smaller ingredients we find, on comparing the Teutonic with the Latin, or Neo-Latin, or Norman elements in English, that the latter have a decided majority over the home-grown Saxon terms. . . . M. Thommerel, who counted every word in the dictionaries of Robertson and Webster, has established the fact, that the number of Teutonic or Saxon words in English amounts to only 13,230 against 29,853 words which can either mediately or immediately be traced to a Latin source. On the evidence of its dictionary, therefore, and treating English as a mixed language, it would have to be classified together with French, Italian, and Spanish as one of the Romance or Neo-Latin dialects. Languages, however, though mixed in their dictionary, can never be mixed in their grammar. . . . We may form whole sentences in English consisting entirely of Latin or Romance words; yet whatever there is left of grammar in English bears unmistakable traces of Teutonic workmanship. What may now be called grammar in English, is little more than the terminations of the genitive singular and nominative plural of nouns, the degrees of comparison, and a few of the persons and tenses of the verb. Yet the single *s*, used as an exponent of the third person singular of the indicative present, is irrefragable evidence that in a scientific classification of languages, English, though it did not retain a single word of Saxon origin, would have to be classed as Saxon, and as a branch of the great Teutonic stem of the Aryan family of speech.' See LANGUAGE.

In tracing the growth of the English language, the history is usually divided into *four* leading periods: the *Anglo-Saxon Period* (A.D. 440–1066); the *Semi-Saxon Period* (1066–1250); the *Early English Period*, comprising the two periods of *Old* and *Middle English* (1250-1550); and the *Modern English Period* (1550 to the present time) But this nomenclature and these divisions are now impugned by an increasing number of scholars, who affirm, not without reason, that English was always English, and never 'Anglo-Saxon;' that the fact of its being inflected in the period before the Norman Conquest, and losing most of its

inflections in later times, is no reason at all for speaking of it as if it were two or even three different languages, and that we have no warrant in the usage of the inflected period for calling our forefathers or their speech anything but English. It is certainly very misleading to name the period immediately succeeding the Conquest *Semi-Saxon*, because it induces people to imagine that the so-called 'Saxon,' that is, the English, element of our language had begun to be mixed up with foreign ingredients, though, in fact, its two great monuments, *The Chronicle*, and Layamon's *Brut*, are almost absolutely free from such. It is probable, therefore, that the old divisions and their designations will before long be abandoned, and they are retained here only because of a usage which has penetrated modern English literature. See ANGLO-SAXON LANGUAGE AND LITERATURE.

As early as the 5th c., Teutonic invaders from the continent settled in this country, and drove the original Celtic-speaking inhabitants to the n. and w. of the island; so that before the battle of Hastings (1066), the tongue of the Teutonic conquerors had been spoken in England for at least 600 years. The final absorption, after numerous conflicts, by the kings of Wessex, or West Saxons, of the various states of the 'Heptarchy,' in the 9th c., went far to make the ruling speech of the land identical with that of Berkshire and Hants, the recognized centre of the predominant sept. The use, besides, of this Southern Anglo-Teuton speech as the chief instrument of literary communication, was permanently confirmed by the influence of King Alfred, a native of Berks. Further back than the time of this literary monarch, we are enabled or permitted to go by only a few existing remains of the language; yet, from the writings of Cædmon, a North Anglian, and a few ecclesiastical MSS. of the kingdom of Northumbria, which extended from the Humber to the Firth of Forth, it has been generally concluded that at least two dialects must have been used in the island—a northern and a southern one. The Anglian or Northern dialect was, to some slight extent, marked by Scandinavian features; while the Saxon or Southern dialect was more purely Low-Germanic, though the Anglian also was Low-German in all essentials. Some have accounted for the partial approximation of the Anglian dialect to Scandinavian by the fact that the Danes, at a later period, effected a settlement in the n.e. of England; but, on the other hand, it is argued that 'certain peculiarities of a Scandinavian character are to be found in the Anglian, even of a date anterior to the first Danish occupation of a part of England, in the latter half of the ninth century.' Nor would this be at all surprising if we admit that the Angles came from that corner of Slesvig still called 'Angeln,' or indeed from any region n. of the Elbe. Some philologers, again, insist on distributing the Anglo-Saxon language into more dialects than two; but it will be sufficient if the reader bear in mind the two above mentioned. It is important to notice here that neither the Anglian nor the Saxon borrowed anything appreciable

from the language of the conquered Britons; in other words, English is very nearly free of any Celtic element. On the other hand, a considerable, but not large, number of Latin words found their way into the English vocabulary before the Norman Conquest, through the introduction of Latin Christianity, and the translation of Latin authors into English.

The period in the history of our English tongue incorrectly described as *Semi-Saxon*, because the inflections that marked the earlier stage then began to give way, dates from a generation after the Conquest until near the middle of the 13th c. Like every transition era, it was a period of confusion, both to those using the language, and to those desirous of tracing its history. The monks of the time, accustomed to the use of mediæval Latin, had in a great measure forgotten the grammar of their native language; and when they attempted to write it, did so very badly. The *Chronicle*, which in its latest form comes down to 1154, and Layamon's *Brut*, written about 1190 or 1200, show traces of the breaking up of the grammar. The inflections and genders of the substantives, the definite and indefinite declensions of adjectives, are for the most part disregarded; a marked partiality is shown for weak preterites and participles; there is a constant substitution of *en* for *on* in the plurals of verbs; and the final *e* is often discarded; besides a great uncertainty prevailing in the government of prepositions. As regards the vocabulary itself, though employed in literature a century and a half after the Norman Conquest. it shows, as already noticed, but few traces of Norman-French (only 90 words in 57,000 verses); proving beyond question that the immediate effects of that great change were by no means so important on the English tongue as they were at one time believed to be.

When we come to the *third* period in the history of English, commonly called *Early English*, we have escaped most of the perplexities which attach themselves to the previous stage of the language. The tendency of the language to substitute an *analytical* for a *synthetical* structure is now seen vigorously at work. The Anglo-Saxon' was moderately rich in inflections, which are now largely discarded. The various modifications of an idea are expressed by some relational word or words attached to the leading idea. During the second or semi-inflected period, the verbs suffered much less inflectional change than the substantives and adjectives; this will be found to hold throughout the entire 250 years of the era of reconstruction. In the fine poem of *The Owl and the Nightingale*, the Anglo-Saxon vowels *a, e, u,* in final syllables, all are represented by *e*, and the final *n*, of the infinitive is beginning to disappear. In the Chronicle of Robert of Gloucester, we encounter, besides, a great number of French words (Dr. Marsh found 4 per cent. in 10 pages), which had gradually become familiar to the people, through the presence of their Norman masters, and through the efforts of the latter to speak English after it was found impossible to supplant it by Norman French. The presence of French is, besides, very

noticeable in the poetry of Chaucer and Gower; but there is no ground for the statement that these writers corrupted the language by a large admixure of novel French words. Dr. Morris is quite correct when he says (introduction to Chaucer's *Prologue*, etc., Clarendon Press series), that Chaucer, 'with few exceptions, employed only such terms as were in use in the *spoken* language, and stamped them with the impress of his genius, so that they became current coin of the literary realm.' And Mr. Skeat remarks (introduction to *Piers the Plowman*, same series) that 'Langland does the very same thing, employing Norman-French words freely whenever he wishes to do so.' As to Scotland also, in the Anglian counties lying s. of the Forth, and as far n. of it as English had got a footing, the language underwent such changes as we have noted in the more southern dialects. Barbour, Scottish contemporary of Chaucer, wrote purer English than Chaucer did, only because he used less French. Regarding the n.e. dialects of Scotland, indeed, some diversity of opinion exists. Some antiquaries are of opinion that the large infusion of Norse or Scandinavian elements in these dialects is to be accounted for by the fact of a Norwegian kingdom having been maintained there more or less from the 9th to the 11th c.; while others allege that the language of the n.e. of Scotland is in substance and grammar as decidedly Anglian as that of Norfolk or Yorkshire.

We may here notice the question which has often been asked: Which of the early dialects spoken in England is the origin of the form now used? We have seen that in the pre-Norman period *two* were employed for literary purposes, a Northern or Anglian, and a Southern or Saxon, the latter of which, through political causes, was perhaps considered the more classical of the two. In the period, however, succeeding the Norman conquest, and especially after 1250, we find not *two* but *three* dialects; a Northern, a Midland, and a Southern. The cause of this was probably the breaking up of the supremacy of Wessex after the battle of Hastings. Circumstances now gave prominence to the Midland counties, in which arose the great universities, the rich monasteries, and many other religious foundations. One of the subdivisions of the Midland dialect, the east Midland, was that dialect in which Orm, Robert of Brunne, Wicliffe, Gower, and, above all, Chaucer wrote. It had then become the speech of the metropolis, and had probably forced it way s. of the Thames into Kent and Surrey. This, therefore, may be considered the immediate parent of modern English, but inasmuch as the Midland gathered into itself from its very position many of the peculiarities of the dialects spoken n. and s. of it, Sir Frederick Madden's view (Layamon's *Brut*, 1851), that we must look for the real groundwork of modern English in a gradual coalescence of the various dialects, may still be considered substantially correct.

ENGLISH LITERATURE.

ENG'LISH LIT'ERATURE: written works of the English people; like every other mental product, it is qualified by the national history. The great social eras of a country's history have always been found to correspond with the great intellectual eras of her growth. It will, however, be sufficient for the present purpose to arrange the literary annals of England into three periods: 1. The period antecedent to the Norman Conquest; 2. The period from the Norman Conquest to the English Reformation; 3. The period from the English Reformation to the present day.

1. *The Period antecedent to the Conquest.*—This period possesses a literature in three distinct languages—the *Celtic*, the *Latin*, and the *English*. Regarding the Celtic literature, see CELTIC NATIONS: IRISH LITERATURE; WELSH LITERATURE. The introduction of Latin literature into this country was considerably later than the Roman invasion. The cultivation of the letters of Rome followed as a necessary consequence on the introduction of Christianity into the country. Toward the close of the 6th c., St. Augustine landed in the s. of England, and laid the foundations of the Anglo-Catholic Church. The great evangelists of that time, however, rather prepared the way for literary effort on the part of others, than were themselves literary. The earliest names recorded are Gildas, Nennius, Bede, Alcuin, Asser, and Erigena. After the immigration of the Angles and Saxons into Britain, this people began to form a literature of their own: see ANGLO-SAXON LANGUAGE AND LITERATURE. Their three historical poems—the Gleeman's Song, the Battle of Finnesburgh, and the Tale of Beowulf (q.v.)—are mainly versions of events which happened on the continent before the descent on the shores of England. Except the remarkable religious poems of the Northumbrian monk Cædmon, in the 7th c., little more of any moment in verse has been handed down to us by the English people who lived before the Conquest. But this people, though comparatively poor in poetry, are eminently simple and straightforward prose writers. King Alfred discarded Latin in all his communications with his subjects, and in consequence the native language made an impressive start through the whole of England. From the *Chronicle*, made from the M.S. of several conventual records, modern scholars have derived special and valuable information. Portions of the sacred Scriptures were translated into English, several of the leading men of the time, such as Aldhelm, Bede, and Alfred, lending their assistance. Sermons and grammars, glossaries and medical treatises, geographies and dialogues between Solomon and Saturn, make up the file of this period of the literature.

2. *The Period extending from the Norman Conquest to the English Reformation.*—The Conquest had the effect of changing the language of the court, the schools, and the tribunals of justice; it took but little effect on the native inhabitants. In a few centuries, owing partly to the obstinacy with which the English people clung to their mother tongue, and partly to the circumstance that long settlement

ENGLISH AUTHORS.

1. Geoffrey Chaucer.
2. William Shakespeare.
3. John Milton.
4. Sir Walter Scott.
5. Thomas Babington Macaulay.
6. William Makepeace Thackery.
7. Charles Dickens.
8. Lord Alfred Tennyson.

in England and political antagonism to France had practically changed the descendants of the Norman conquerors into English nobles, and inspired them with English feelings, the latter began to abandon the use of French. 'In 1349, boys ceased to learn their Latin through the medium of this tongue; and in 1362 (the 36th year of Edward III.), it was directed by act of parliament that all pleadings in the law-courts should henceforth be conducted in English, because, as it stated in the preamble to the act, French was become much unknown in the realm' (Morris's *Historical Outlines of English Accidence*, 1872). In a generation or two after the Conquest, classical and theological learning made considerable progress. Monasteries were busy, and both the English universities were by this time founded; while an interchange of teachers and pupils constantly went on between the English seminaries and those of France and other countries. Lanfranc and Anselm, Hales and Duns Scotus, Michael Scot and Roger Bacon, had attained great eminence in speculative and in physical philosophy. Doubtless their thinking was characterized more by its hair-splitting ingenuity than by its solidity, but the 12th and 13th c. stand out in a distinguished manner in England, and indeed throughout Europe, for their peculiar devotion to speculative studies. But all these philosophers wrote in Latin, as did the historical writers of the same period, of whom the chief were William of Malmesbury, Geoffrey of Monmouth, Giraldus Cambrensis, and Matthew Paris. A literary feature of the age which must not be overlooked was the frequency of satire in rhymed Latin verse. The most notable of the mediæval satirists was Walter Mapes, to whom is ascribed (though evidence of authorship is not conclusive) certain clever half-scurillous poems, from one of which, the *Confessio Goliæ*, have been extracted a number of verses, commonly but erroneously spoken of as a 'drinking-song' (see MAPES). The satire passed from the clergy, and was directed against the feeble King (John). De Montfort and the other great barons who distinguished themselves at Runnymede, are the theme of popular praise. In the same Latin tongue was composed the oldest legendary work of the Middle Ages. The *Gesta Romanorum* (q.v.) is a compilation of uncertain origin. The stories themselves are in many cases of great antiquity, and in their earliest forms can be traced to the distant East. In their Latin dress they were the property, not of England only, but of all Western Christendom, and their only claim to notice in a special survey of English literature arises from the fact that their editor, Elinandus, was perhaps an Englishman, and that they have furnished (at second or third hand) incidents and plots to the genius of Shakespeare and Scott. In the same relation to English literature stands *The Seven Wise Masters*, traceable back to India, but known to all Western Europe in a Latin form, and to England in particular under the title of the *Process of the Sevyn Sages*. The French Fabliaux affected English literature but little before the time of Chaucer. On the other hand, the romances of chivalry, rude and spir-

ited, pathetic and imaginative, are well worth the attention of the student of English literature. The best of these, written first in French, afterward translated into English, celebrate the glory and fall of King Arthur and his knights of the Round Table, of which splendid use has recently been made by Alfred Tennyson in his *Idylls of the King*.

Meanwhile the English tongue was undergoing those serious grammatical and phonetic changes to which reference has already been made. During this half-chaotic stage it was scarcely fit to be a vehicle of literary expression, even if the ignorance and helplessness of the conquered people had not of themselves been sufficient to prevent the growth of a vernacular literature. The first indication of reviving life is the appearance of Layamon's *Brut* (see LAYAMON) about the close of the 12th c. The next century is comparatively rich in writers who use the English tongue, and whose works, if not masterpieces of artistic skill, are at least invaluable for linguistic purposes. The most important of these writers are Orm, Guildford, and Robert of Gloucester.

The period of what is called *Early English, embracing the 14th and 15th c.* is of great importance in the progress both of English history and of English literature. The translation (first ever executed) of the Bible into English, completed by Wicliffe about 1380, is a work of great value, not only as a monument in the religious history of the nation, but in a philological point of view, being, as it is, almost the first among the prose-writings in that form of the English tongue now in use. The principal book which precedes it, and the very oldest written in 'Early English,' is Sir John Mandeville's account of his eastern travels (1356). Somewhat later (1390–1400), Geoffrey Chaucer, genuine father of English poetry, published his *Canterbury Tales*. A shrewd and sagacious observer, he has left behind him in these *Tales* a series of sportive and pathetic narratives, told with such wonderful tenderness and humor, in such a simple, healthy style (though his vocabulary is largely modified by French, and is not a 'well of English undefiled'), that they have been the wonder and delight of all succeeding times. Laurence Minot, Richard Rolle, Langland, author of *Piers the Plowman*, and Gower, fitly close round Chaucer as contemporaries who wrote more or less vigorous verse. About the same period lived in Scotland John Barbour, whose epic narrative, *The Brus*, written about 1376 is incomparably the greatest of all the metrical chronicles. In the following c. (the 15th), and in the early part of the 16th, occur in England the names of John Lydgate (1430), whose *London Lyckpeny* is still agreeable reading; Alexander Barclay, whose *Ship of Fools* was printed 1509; John Skelton, author of the scurrilous satires of *Colin Clout* and *Why Come ye not to Court?* (died 1529); Howard, Earl of Surrey (beheaded 1546–7), who wrote the first sonnets and the first blank verse in the English tongue; and Sir Thomas Wyatt (died 1541). The prose-writers of this period are Sir John Fortescue, chief justice of the King's Bench under Henry VI., who lived

1430–70, and who wrote, among other things, a tract on the *Difference between an Absolute and Limited Monarchy, as it more particularly regards the English Constitution;* William Caxton, who introduced printing into Britain 1477—the first book ever printed in this country being a translation of the French work *Le Recueil des Histoires de Troye;* Sir Thomas Malory, whose *Morte Darthur* (1469–70) is the final form of the old Arthurian romance; Hall, English lawyer (died 1547), who wrote a chronicle of the *Wars of the Roses;* and Tyndale (burned 1536) for heresy. In Scotland, during the same period, we encounter in poetry the names of James I., king of Scotland (murdered 1437), author of the *King's Quhair,* etc.; Andrew Wyntoun, prior of Lochleven, whose *Orygynale Cronykil of Scotland* was completed about 1420; Blind Harry, author of *The Adventures of William Wallace,* written about 1460, long exceedingly popular with the Scottish peasantry; Robert Henryson (died abt. 1500), author of *The Testament of Cresseid,* etc. William Dunbar (died abt. 1520), whose *Dance of the Seven Deadly Sins* shows him to have possessed great boldness and vigor in delineation of character; and Gavin Douglas (died 1522), whose best work is a translation of Virgil's *Æneid* into English verse—at least into what both Scotchmen and Englishmen then reckoned English verse.

3. *The Period extending from the English Reformation to the Present Day.*—Among the brilliant works of the Elizabethan age, there is probably none of which we may not detect germs in some of the efforts in the century that preceded. In theology, the names of Latimer (burned 1555), of Cranmer (burned 1556), and of Ridley (burned 1555), shine forth conspicuously; and it is sufficient to mention Sir Thomas More (beheaded 1535), author of *Utopia,* a curious philosophical work, and Roger Ascham (died 1568), as excellent miscellaneous writers of that time. The last mentioned, indeed, exercised considerable influence on the development of the English tongue, and his *Scholemaster* is even yet influential. We may here mention the Scotchmen, Mair or Major, Sir David Lyndsay, Boece, Melville; and, above all, George Buchanan, universally admitted to have been one of the finest classical scholars that ever appeared in Christendom.

For the origin of the English drama, see DRAMA: MYSTERIES AND MIRACLE PLAYS. It is necessary here only to note that the first English comedy, *Ralph Roister Doister,* was written by Nicholas Udall about 1552–3, and the first English tragedy, *Gorboduc,* or *Ferrex and Porrex,* by Sackville and Norton a few years later. The era on which we are next to look, the Elizabethan, is the most brilliant in the literary history of England. We may quote here the words of Lord Jeffrey: 'In point of real force and originality of genius, neither the age of Pericles, nor the age of Augustus, nor the times of Leo X. or of Louis XIV., can come at all into comparison. For in that short period we shall find the names of almost all the great men that this nation has ever produced; the names of Shakespeare, and Bacon, and Spenser, and Sidney; of Raleigh, and Hooker,

and Taylor; of Napier, and Milton, and Cudworth, and Hobbes; and many others—men, all of them not merely of great talents and accomplishments, but of vast compass and reach of understanding, and of minds truly creative; not men who perfected art by the delicacy of their taste or digested knowledge by the justness of their reasonings; but men who made vast and substantial additions to the materials upon which taste and reason must hereafter be employed, and who enlarged to an incredible and unparalleled extent both the stores and the resources of the human faculties.' Even the minor dramatists of the time, such as Marlowe and Chapman, Beaumont and Fletcher, Jonson and Drummond, all are nearly the equals of any succeeding poets that have appeared. In the latter half of this period a new class of poetic writers started up, lyrical rather than dramatic, whose occasional verses, sometimes descriptive, sometimes amatory, sometimes religious, are characterized by a bright and delicate fancy, as if morning sunbeams glittered on their pages. These are George Wither, William Browne, Francis Quarles, and George Herbert, 'the sweet psalmist of the 17th century' (as Emerson calls him) The last 40 years of the 17th c. are generally known as the age of the Restoration and the Revolution. During this period, the literature of the stage was disgraced by its indecency. Charles II. and his dissolute court had brought back with them from France a love of polite profligacy, which found its most fitting expression in the comedy of intrigue. Four names stand out conspicuous as 'sinners above all men in that generation'—Wycherly, Congreve, Vanbrugh, and Farquhar. Yet theology could boast of such names as Baxter, Owen, Calamy, Collier, Leighton, South, Tillotson, and Barrow. This was the epoch also when the great Milton, driven into the shades of obscurity by political adversities, fulfilled the uttered hope of his youth, and wrote 'something which posterity will not willingly let die.' About this time, too, Walton angled, and Butler burlesqued dissent; Marvell turned his keen irony against the High Church; Locke and Newton speculated and discovered; and John Dryden, literary chief of the time, 'found the English language' according to Dr. Johnson, 'of brick, and left it of marble.'

The literary history of the 18th c., and of the reign of Queen Anne, has been variously estimated. If it was overvalued, says Prof. Spalding, by those who lived in it, and in the age that succeeded, it has assuredly been undervalued in our own day. It was long glorified as the Augustan age of English literature; but among ourselves it has been set aside as a skeptical, utilitarian age, when poetry could find no higher field than didactic discussion, and prose found nothing to amuse but comic and domestic narrative, or bitter and stinging satire. The truth, as usual, lies in the middle. This age was far from being superior to every era that had gone before it, and it was not quite so low as some of its hostile critics have represented. One thing, however, is beyond dispute, viz., that the *form* both in poetry and in prose, had come to be much more regarded

than the *matter*. Addison, Swift, and Johnson may be taken as types of the prose writers of this century. Defoe, the author of *Robinson Crusoe*, will live forever. The poetry of the time is represented by Pope, and it has been gravely asked whether he is a poet at all. Young and Akenside were animated by a higher poetic sense, and the same may be said of Thomson, Gray, Collins, Beattie, and Cowper. The greatest poet, however, of the 18 c. was Robert Burns. Richardson, Fielding, Smollett, Sterne, Goldsmith, and Mackenzie are the novelists of this period; Hume, Robertson, and Gibbon, its historians; Butler, Berkeley, Clarke, Shaftesbury, Hume, Paley, and Adam Smith, its philosophers.

The 19th c. was so prolific in every department of literature that pages would be required merely to catalogue the names of well-known authors. It produced none so supremely alone as Shakespeare, Milton, and Bacon, but it numbers not a few of the eminent among the multitude who may be characterized as noted. The first quarter of this century was made illustrious by the original genius of Wordsworth and Coleridge, Scott and Byron, Shelley and Keats, near to whom, in general estimation, were Campbell, Southey, and Moore; and other poets of the time, such as Hogg, Cunningham, and Rogers, deserve mention. Wolfe, who wrote *The Burial of Sir John Moore*, and Hood, author of *The Bridge of Sighs*, are examples of those who are immortal in one or several exquisite brief poems. The religious poets include Heber, Keble, Milman, Montgomery, Pollok, and Bowring. Others excelled in ballad writing, as Aytoun, Lockhart, and Macaulay; in humorous legends, Barham; in lyrical and other verse, Croly, Dibdin, Dobell, Elliott, Robert Bulwer Lytton, Mackay, Massey, Milnes, Praed, Patmore, Procter, Arnold, and Rossetti. The great poets of the second and third quarters of the century were Tennyson and Browning, the former worthily the laureate, and both supreme in their way. Later there came into repute William Morris, Sir Edwin Arnold, and Swinburne. Among the more distinguished poetesses are Mrs. Norton, Eliza Cook, Miss Landon, Mrs. Hemans, Adelaide Procter, Mary Howitt, Jean Ingelow, Mrs. Mulock-Craik, Christina Rossetti, and Mrs. Browning. The dramatists were well represented by Joanna Baillie, Miss Mitford, Knowles, Edward Bulwer Lytton, Milman, Talfourd, and Tom Taylor; and playwriters have been numerous. The 19th c. also abounded in novelists, essayists, reviewers, and journalists. The first half of the period is memorable for the masterly reviews and essays of Jeffrey, Sydney Smith, Wilson, Hazlitt, Lamb, John Foster, DeQuincey, Macaulay, and Carlyle, all partaking of a more purely literary spirit than the political, sociological, and scientific contributors who have especially given character to the quarterlies and monthlies of more recent years. Arthur Helps is a bright example of those who have combined the two tendencies.

Miss Martineau and Frances Power Cobbe are noted names in periodical literature. In religious discussion and essays Whately, Isaac Taylor (senior), James Martineau, F. W. Maurice, J. R. Seeley, and Henry Rogers were very conspicuous; in the tractarian movement, Keble, Pusey, and J. H. Newman; in the Catholic ranks, F. W. Faber, Wiseman, and Manning. While English secular oratory declined in that century, the pulpit was not wanting in men of eloquence, as witness Hall, Irving, Chalmers, Robertson, Liddon, Vaughan, Stanley, Farrar, Spurgeon, and others; and in Biblical literature may be named Kitto, Alford, Trench, Conybeare, Howson, Henderson, Westcott, Ellicott, Davidson, and Tregelles. Mental philosophy is represented by Reid, Stewart, Brown, Hamilton, and Bain; the intuitive ethical, by Calderwood; the utilitarian, by Bentham and the two Mills; the evolutionary, by Herbert Spencer; and the history of philosophy, by Morell, Lewes, and in part by Lecky. Maine contributed much to the subject of ancient law; Buckle applied positivism to the history of civilization; and Senior, M'Culloch, the Mills, Fawcett, Price, and Jevons were all noted political economists. In æsthetics, Ruskin is most prominent, and next to him, Leslie, Eastlake, Mrs. Jameson, Hamerton, and others. The novelists of that period were so numerous that only a few whose works continue to be read can be mentioned, such as Scott, Dickens, Bulwer, Thackeray, the Brontës, Maria Edgeworth, 'George Eliot' (Mrs. Lewes), Charles Reade and Anthony Trollope, with others who might be named as likely to live in their well-known works, unless crowded out of memory. The list of biographers is long, including Scott, Southey, Moore, Talfourd, Lockhart, Carlyle, Forster, Dixon, Lewes, Stanley, Smiles, Froude, Morley, and others. English history has been ably written by Mackintosh, Turner, Lingard, Knight, Hallam, Macaulay, Stubbs, Froude, and Green; Grecian, by Mitford, Gillies, Thirlwall, and Grote; Roman, by Merivale and Arnold; and other historical works or studies of importance are by Alison, Milman, Rawlinson, Gladstone, Freeman, etc. Books of travel and exploration abounded, especially those relating to central and western Asia, interior Africa, and the arctic regions; and philology and archæology have had distinguished investigators, as in Egyptian, Assyrian, and East Indian fields. Natural and physical science show an illustrious roll of names, in almost every instance with literary excellence added to scientific achievements; the name of Charles Darwin, whose *Origin of Species* is one of the epoch-making books of the world, stands pre-eminent; but Priestley, Young, Davy, Brewster, Herschel, Faraday, Huxley, and Tyndall all made their scientific writing contributory to literature of the highest class.

The last quarter of the nineteenth century and the early years of the twentieth were marked by great literary activity, though in general one notes a high level of

excellence rather than the predominance of supreme genius. Style was cultivated with conscious art; and learning, minutely specialized, worked out admirable results. In history many interesting and valuable treatises were composed by Gardner, Shuckburgh, Oman, Bury, and others in the sphere of Greek and Roman life; while more modern periods were treated in an informing way by Bryce, S. R. Gardiner, Justin McCarthy, Fyffe, and Herbert Paul. Many valuable biographies were likewise produced, notably those of Tennyson by his son, of Gladstone by John Morley, and of Napoleon by Rose. Criticism, both literary and æsthetic received great attention, reaching its highest point in the history of English letters with the work of Matthew Arnold and Walter Pater; while Saintsbury for his varied learning, and Gosse for his delicate appreciation, compel serious mention. Sound judgment inheres in the critical studies of Dowden, and unusual, though erratic, brilliancy in the opinions of G. K. Chesterton. Among other serious essayists are to be reckoned Sir Richard Jebb and Professor Butcher, both of them admirable examples of English scholarship and taste. R. L. Stevenson was a unique example of preciosity and creativeness. Contributions to philosophy were made by Ward, Bradley, the two Cairds, A. J. Balfour, and Jowett; and to English philology by Skeat and Murray. Professor Jowett made a permanent contribution to both philosophy and literature by his translation and exposition of Plato.

Poetry seemed to decline after the death of Tennyson and was represented mainly by minor versifiers such as Austin Dobson, Stephen Phillips, William Watson, Arthur Symonds, Alfred Austin, and Francis Thompson. On the other hand, fiction-writing flourished as it never had before. The novel, indeed, steadily increased in importance as an exposition of life and a commentary upon it. Three writers of very different characteristics occupied the first rank, each having undoubtedly the compelling quality of genius. George Meredith, though obscure at times, excelled in a deep knowledge of human nature and in a singularly individual humor. Thomas Hardy embodied the pessimism which marked the closing years of the century, exhibiting a certain grim power which at once fascinated and depressed his readers. More vivid and more unconventional than either, Rudyard Kipling sounded the note of a daring imperialism. Both his short stories, his poetry, and his longer novels are imbued with the pride of race, a certain arrogance and superb disdain, while his tense nervous style and striking vocabulary won for him a hearing all over the English-speaking world. After these three novelists come Maurice Hewlett, whose historical romances reproduce accurately the atmosphere of the Middle Ages; and George Moore, who grafted upon English literature the naturalistic tendencies of Zola and the other French realists. Of great merit also, when one considers the

best of their productions, are Hawkins ("Anthony Hope"), Sir Conan Doyle, George du Maurier, George Gissing, and Morley Roberts. Highly popular, though of no lasting importance, were Hall Caine and Marie Corelli. Among women novelists Mrs. Humphrey Ward was held to be the natural successor of George Eliot as a delineator of contemporaneous English life. Other women who gained success in the field of fiction were Mrs. Harrison ("Lucas Malet"), Mrs. Frankau ("Frank Danby"), and Mrs. Craigie ("John Oliver Hobbs"). All these writers showed remarkable excellence of technique, and many of their books possess a genuine historical value because of the accurate pictures which they give of the times in which their writers lived.

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ENGORGE, v. *ĕn-gŏrj'* [*en*, in; F. *gorger*, to gorge]: to put into the throat or gorge; to swallow with greediness; to swallow in large quantities; to devour; to gulp down. ENGOR'GING, imp. ENGORGED', pp. *-gŏrjd'*. ENGORGE'MENT, n. a swallowing greedily; in *med.*, applied to an overfilled state of the vessels of a part.

ENGRAFT, v.: see INGRAFT. ENGRAFF, v. *ĕn-grăf'*, in *OE.*, to graft; to unite. ENGRAFTING: see GRAFTING.

ENGRAIL, v. *ĕn-grāl'* [F. *engrêler*—from *grêler*, to hail]: in *her.*, to spot as with hail; to make ragged at the edges. ENGRAILED', pp. a. *-grāld'*, indented along the edges as with hail: N. a line composed of a series of little half-moons, or semicircles. In *heraldry*, grailed is the opposite of invected. ENGRAIL'MENT, n. the ring of dots round the edge of a medal.

ENGRAIN, v. *ĕn-grān'* [*en*, and *grain*]: to cover or dye deeply; to dye in the grain. ENGRAIN'ING, imp. ENGRAINED' pp. *-grānd'*, dyed in grain.

ENGRAVE, v. *ĕn-grāv′* [*en*, and *grave*]: to cut figures or letters on metals, rare stones, pebbles, wood, etc.; to imprint or impress deeply, as on the memory. ENGRA′VING, imp.: N. the art of cutting devices, figures, or letters on metals, stones, etc.; the print from an engraved plate. ENGRAVED′, pp. *-grāvd′:* ADJ. marked as with a chisel; imprinted: deeply impressed; also ENGRAVEN, pp. *ĕn-grāv′n.* ENGRA′VER, n. one who; a carver. ENGRA′VINGS, n. plu. impressions on paper taken from copper or steel plates—those from wood blocks are usually called *wood-cuts.*

ENGRAV′ING: in its widest sense, art of incising designs, writing, etc., on any hard substance, such as stone, metal, or wood. Many branches of the art are of great antiquity; such as gem-engraving, cameo-cutting, and die-sinking. For the more important of these ornamental and useful kinds of engraving see the proper titles. But in a narrower sense, engraving is the special designation of the art of cutting or indenting the surface of metal plates or of blocks of wood with designs, for the purpose of taking off impressions or *prints* of the designs on paper. This department of the art arose as late as the 15th c., the earliest wood engraving with a date being 1423, and the earliest dated engraving from a metal plate being 1461.

Wood engraving differs from engraving on metal in this, that on a metal plate the traces or marks which are to appear on the paper are cut or sunk into the plate, and when printed from are filled with ink, while the rest of the surface is kept clean; whereas in wood engraving they are left prominent or in relief, and the blank parts of the design are cut away. Hence a wood-cut acts as a *type*, and is inked and printed from in the usual way: see PRINTING. This makes wood engraving peculiarly suitable for illustration of books; as the blocks can be printed from together with the letterpress; while the impressions from a metal plate must be taken by themselves, and by a slow process. See WOOD-ENGRAVING.

As to engraving on metal, with which this article is concerned, the metals most used are copper and steel, the former having the advantage of being more easily worked, the latter of greater durability. The process of working are essentially the same in both. The several manners or styles of engraving are distinguished as Line-engraving, Mezzotinto, Stippling, and Aquatinta.

1. *Line-Engraving*—in which, as the name implies, the effect is produced by a combination of lines—is executed either by direct incision with the graver or the dry-point, or by a combination of incision with *etching*—a chemical process below described. The *graver* or *burin* is usually in the form of a quadrangular prism, fitted into a short handle. In making the incision, the graver is pushed forward in the direction of the line required, being held by the handle, at an angle very slightly inclined to the plane of the copper. A *scraper* is required to scrape off the barb of burr which is

formed by the action of the graver and dry-point. The *rubber* is a roll of cloth dipped in oil, and is used to make the surface smooth. A *burnisher* is required to polish the plate, and erase any scratches which it may accidentally receive; also to make lighter any part of the work which may have been made too dark. The *dry-point* is like a sewing-needle fixed into a handle, and is used to cut or scratch the finer lines. The graver cuts the copper clean out; the dry-point throws it up on each side, and in some cases this is not scraped off, but made use of till it is worn off, as it gives richness to the line.

In etching, the first step is to cover the plate with a composition of wax, asphaltum, gum mastic, resin, etc., dissolved by heat; an outline of the design, made on paper in pencil or red chalk, is then 'transferred' to the surface of this composition, by being passed through a press. The subject is then drawn on the ground with the etching-point, which cuts through it, and exposes the copper. *Etching-points* or *needles* resemble large sewing-needles shortened, and fixed into handles four or five inches long; some are made oval, to produce broader lines. A rim of wax being put round the plate, acid is poured on, and corrodes the copper not protected by the ground. If the acid is found not to have acted sufficiently, it may be applied again to the whole design, or only to portions of it, by *stopping up*, with a mixture of lampblack and Venice turpentine applied with a camel-hair pencil, what has been sufficiently *bitten in*.

When a series of parallel lines are wanted, as in backgrounds, etc., an ingenious machine called a ruler is employed, the accuracy of whose operation is perfect. This is made to act on etching-ground by a point or diamond connected with the apparatus, and the tracings are bit in with aquafortis in the ordinary way.

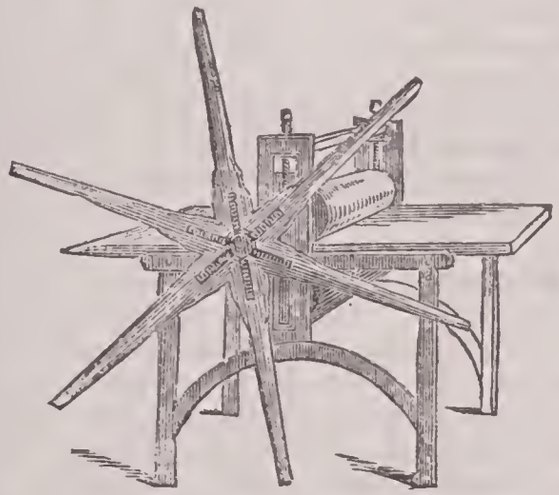
2. The process of *mezzotinto* is much less difficult than line-engraving. The plate is prepared by being indented or hacked all over by an instrument with a serrated edge, called a cradle, which is rocked to and fro upon it in all directions. The barb or nap thus produced retains the printer's ink, and if printed, a uniform dark surface would be the result. On this plate, after a tracing has been transferred, the engraver goes to work with tools called scrapers and burnishers—those parts of the ground most smoothed being the highest lights, and the ground the least operated on producing the deepest shadows. As the work proceeds, it may be blackened with ink, applied with a printer's ball or otherwise, in order to ascertain the effect. The design is sometimes etched on the plate by the ordinary process, before the mezzotinto ground is laid.

3. *Aquatint Engraving.*—By this method, the effect of drawings in Indian ink is produced; and at one time it was greatly made use of in rendering the drawings of Paul Candby and early water-color painters, and particularly prints for drawing-books. In this process, a very complex kind of etching, the ground composed of pulverized resin and spirits of wine, assumes when dry a granulated form; and the aquafortis acting on the metal between the particles,

reduces the surface to a state that an impression from it resembles a tint or wash of color on paper. David Allan engraved his celebrated illustrations of the *Gentle Shepherd* in this manner. It has now gone almost entirely out of use having, like engraving in imitations of drawings in chalk or pencil, been in a great degree superseded by lithography.

4. In Engraving in *Stipple*, much in vogue in the end of the last c., the drawing and effect are produced by small dots, in place of lines. Ryland, Bartolozzi, and Sherwin, excelled in this style. It is well suited for portraits; several of Raeburn's have been capitally engraved in stipple by Walker. It involves much more labor than mezzotinto, and is now little practiced.

Plate-printing.—Copper-plates, engraved in any of the above styles, are ready for press as soon as they are finished by the engraver. The method of printing from them is very simple. Their engraved surface is daubed over with a thick oleaginous ink, so that the lines are effectually filled. As this dirties the whole of the plate, it is necessary to clean it, which is done by the workman wiping it first with a piece of cloth, and then with the palms of his hands, rubbed on fine whiting. It may be calculated that a hundred times more ink is thus removed than actually remains in the indentations; however, such a process is necessary. The plate being thoroughly cleaned, is laid on a press (see fig.), with a piece of damped paper over it; and



being wound beneath a roller covered with blanket-stuff it is forced to yield an impression on the paper. The plate must be kept at a moderate warmth during the operation. The frequent rubbing of the plate with the hand to clean it, as may be supposed, tends greatly to wear it down; and such is the wear chiefly from this cause, that few copper plates will yield more than a few thousand impressions in good order. The earliest, called *proofs*, are always the best and most highly prized.

In consequence of this defect in copper, the practice of *engraving steel-plates*, for all subjects requiring a great many impressions, has become very common. This process was introduced by the late Mr. Perkins, of London, who origi

nally softened the plates, engraved them, and then rehardened them—a practice now abandoned, as ordinary steel-plates can be worked upon by the burin, dry-point, scraper, and burnisher with perfect facility. Etching on steel-plates is executed much in the same way as in the process on copper. An E. on a steel-plate may be transferred in relief to a softened steel cylinder by pressure; and this cylinder, after being hardened, may again transfer the design by rolling it upon a fresh steel-plate; thus the design may be multiplied at pleasure.

History of Engraving.—This most important invention, by which the productions of art are diffused without limit, is said to have been accidental, and is claimed for Tommaso Finiguerra, who first took impressions on paper about 1440. His employment was executing ornamental E., chiefly on articles used in religious services, such as small portable shrines, or altar-pieces. These were generally of silver, and the designs engraved on them were filled up with a black composition that hardened in a short time. This composition was called in Italian *niello* (from Lat. *nigellus*, dim. of *niger*, black), and the workers in it *niellatori*. It was the practice of Finiguerra, in executing his work, to prove it by rubbing lampblack and oil into, and pressing paper over it; he thus obtained an impression of his work as far as to a particular stage, and was enabled safely to carry it on till it was completed. Finiguerra's title to the invention has been disputed; and in a recent work by J. D. Passavant, *Le Peintre-Graveur* (Leip. 1860), a strong case seems made out for its German origin. Be that as it may, the principal early Italian engravers who followed Finiguerra, were Bacio Baldini (abt. 1436–1515); Sandro Botticelli (1437–1515)—he embellished an edition of Dante's *Inferno*, brought out 1481; Antonio Pollajuoli (1426–98, at Florence); Andrea Mantegna (b. Padua, 1431, d. Mantua, 1505); and Marc Antonio Raymondi (b. Bologna, 1487 or '8, d. 1539), who executed his chief works at Rome. The most celebrated early German engravers were Martin Schoengauer (b. Colmar, 1455, d. 1499); Israel van Mecheln, or Meckenen (b. Meckenen on the Meuse about 1450, d. 1523); Michel Wohlgemuth (d. 1519); Albert Dürer (b. Nürnberg, 1471, d. 1528); and Lucas van Leyden (b. Leyden, 1494, d 1533). The engravings of all these artists are very valuable, not only from their scarceness, and as illustrating the early history and progress of the art, but as exemplifying many high qualities never surpassed in later times. The most of them were painters, and engraved their own works, except Marc Antonio, who engraved chiefly those of Raphael, by whom he was employed and who occasionally overlooked and directed him. All those engravers, and their immediate followers, executed their works with the graver; but soon afterward engravings came to be generally executed by two processes—etching, and cutting with the graver or the dry-point. The works of these early masters are often remarkable for character and expression, as those, for instance, by Mantegna; and for the correctness and high

style of the drawing, for which qualities Marc Antonio has never been surpassed; also for finish of the most careful and elaborate kind, carried further by Albert Dürer and Lucas van Leyden than by any other engravers. The styles of these early engravers were cultivated by numerous successors, several of whom followed their masters as closely as they could, while others diverged into something like originality: the chief names are Agostino Veneziano, about 1620; Nicolas Belin da Modena, and Giov. Ghisi, 1630; Luc. Damesz (d. 1533); Giov. Giac. Caraglio, and Marco da Ravenna, about 1640; Giul. Bonasone (b. Bologna, 1498, d. Rome, 1564); Eneus Vicus, George Vens, Henrid Aldegraf, and Jean Sebast. Bœhm, about 1550; Adrian, Charles, William, and John Collert, Adam and George Ghisi, Sutermann, Virgilius Solis, Cornelius Cort, Martin Rota, and others, ranging from the middle to the end of the 16th c. Agost. Caracci, celebrated painter, executed many spirited engravings. Saenredam, De Bruyn, Galle, Kellerthaller, Alberti, De Goudt, C. de Pass, Sadeler, are names of well-known engravers that enter on the 17th c. Henry Goltzius is noted for the number and variety of his works, and his imitations of the styles of the older masters. In the plates of engravers toward the middle of the 17th, and beginning of the 18th c., a large proportion of the work consists of etching, the graver being used chiefly for deepening and clearing up the etching. This arose from this manner of working being well adapted for rendering the style of the painters of that period, whose works were distinguished for freedom of execution or touch, and clearness and transparency. The most noted engravers of this period were the Vischers, 1610–50, who engraved many of Berghem's pictures; Bolswert, 1620; Lucas Vosterman the Elder, 1630; Suyderhoef, about 1640. These engravers rendered many of the works of Rubens in a very spirited manner. Coryn Boel—whose engravings from Teniers are in some respects superior even to Le Bas—Troyen, and Van Kessel, are worthy contemporaries.

In the age of Louis XIV., a race of engravers of portraits arose, who carried execution with the graver almost to perfection. The works of the artists from whom they engraved were florid in style, with great display of drapery and lace, and accessories in the backgrounds elaborately executed. Among these engravers the following rank highest: Gerard Edelinck (b. Antwerp 1627, d. Paris 1707)—one of the best engravers of the period, and specially patronized by Louis XIV.; Masson (1636–1700); Larmessin (b. 1640–84); Drevet the Elder (1664–1739); Drevet the Younger (b. 1697); Gerard Andran (1640–1703). There was a large family of Andrans engravers, but Gerard was the most celebrated, indeed he was one of the best of the French engravers. Among engravers of talent in England were Robert Walker (b. 1572); William Faithorne (b. London between 1620-30, d. 1694) executed many excellent engraving of portraits; George Vertue (b. London 1684–1756), a good engraver, and a man of general information and taste in art; John Smith (b. London 1654, d. 1722) executed

in mezzotinto a vast number of interesting portraits. In the 18th c. there were numerous excellent engravers, by whose works the taste for the pictures of the Dutch school of the 17th c. has been widely extended. Two of the most distinguished of these were John Philip le Bas (b. Paris 1708, d. 1782) and John George Wille (b. Königsberg 1717, d. 1808). Their styles are totally dissimilar. Le Bas's plates are chiefly etched, and remarkable for spirit and sharpness of touch and transparency; accordingly, mostly all his works are after painters who excelled in these qualities, particularly Teniers. Wille's engravings are of the most careful and elaborate description, and his best prints are after Gerard Dow, Terburg, Mieris, and Metzu—masters distinguished for the high finish of their pictures. He worked with the graver; and his plates are notable for the precision and clearness with which the lines are cut.

It was about the middle and latter portion of last c. that engraving reached its highest point in England. The works of William Hogarth (b. London 1698, d. 1764) are of world-wide celebrity, but that is owing mainly to the excellence and dramatic interest of the pictures from which the engravings are made, though, no doubt, his prints are engraved in a firm clear style, similar to that practiced by the French engravers of the time, several of whom were employed by him. It was Sir Robert Strange (b. Orkney 1721, d. London 1792), engraver of figures, and William Woolet (b. Maidstone 1735, d. London 1785), landscape-engraver, who imparted to English engraving those qualities and characteristics that enable England to claim a style of engraving that is national, differing from other styles, and that has arisen and been best carried out in that country. In drawing and form, Strange was rather defective; but he excelled in what engravers call color, or the art of producing, by means of variety of line, a texture or quality that compensates for the lack of color, by giving to the E. something of the richness produced by color in a picture. His imitation of the softness and semi-transparency of flesh was particularly successful, and superior to that of the French engravers, whose works, though in most respects admirable, failed in that respect, and had, in the more delicate parts, a hard or metallic look. Woolet treated landscape-E. in a manner totally new, imparting more firmness and decision, by making great use of the graver. His works have more finish and force than former landscape-engravers, but they are in some degree liable to the objection of hardness, in the treatment of foliage in particular. The works of these two engravers have had a marked influence on art. The merit of Strange's style was acknowledged on the continent; he was elected a member of the Academies of Florence, Bologna, Parma, and Rome. At the end of last c., art had fallen very low on the continent, but a regeneration was beginning; and in Italy, engravers were then arising, such as Volpato and Cunego, who studied and imitated the softness and, technically speaking, fleshiness of texture that distinguished the works of the British engraver; those were followed by Raphael

Morghen, Longhi, Mercurii, and others, in Italy; by Boucher Desnoyers, Forster, etc., in France; and by Müller, Keller, Gruner, and numerous other engravers in Germany. By them, E. has been carried to the highest pitch. Among their works, the following are *chefs-d'œuvres: The Last Supper*, after Da Vinci, by R. Morghen; the *Sposalizia*, after Raphael, by Longhi; *La Belle Jardinière*, and other works, after Raphael, by Boucher Desnoyers, who has engraved the works of Raphael perhaps on the whole better than any other engraver; *The Madonna de San Sisto*, by Müller, and *The Dispute on the Sacrament*, after Raphael, of Keller. No engravings executed in England come up to the works of these last-named masters, who have engraved works of a higher class than the majority of those done by Strange, while the drawing and general treatment of their works are in a purer and more correct style. However, the engravings of Burnet, Raimbach, Stewart, and others after Wilkie and contemporary British painters, deservedly hold the highest place among works of the class to which they belong, and betoken clearly the great influence which Strange exercised on their style. At present, few figure-subjects are executed in the line-manner, and that art in England has certainly fallen. This may be accounted for, perhaps, by the great use made of mechanical appliances, in portions of the work, to save time, and by the preference shown for mezzotinto-engraving as practiced at present, that is, with a mixture of lining or stippling. The greater number of Landseer's works have been engraved in that way, and it is now adopted for rendering the works of John Phillip and Millais, and the leading artists of the day. Several, however, of Landseer's earlier works have been engraved in the line manner, particularly his pictures of *Drovers leaving the Grampians*, and *The Watering-place*, by Watt, which are capital examples of line-engraving. There is no good modern school of landscape-E. on the continent; the influence of Woolet was confined to his own country, where landscape-E., particularly in illustrated works after Turner, has attained great excellence.

Toward the end of last c., mezzotinto-E. was practiced in England with great success; arising from its peculiar fitness to render effectively the works of Sir Joshua Reynolds. M'Ardell, Earlom, Watson, Smith, Valentine Green, and Ward were among the best engravers of his works. The invention of this process is generally ascribed to Prince Rupert, some ascribe it to Dr. Wren, 1662, and state that Prince Rupert merely improved on the invention. It has been practiced very generally from the time of its invention, but attained its highest position in Sir Joshua's time; and it is very successfully carried out now, in an altered manner, additional force being aimed at, by means of stippling and etching. It is well calculated for producing broad effects: Turner's *Liber Studiorum*, and the landscapes after Constable, are admirable examples of its capabilities in this way; the effect in Turner's plates, however, is heightened by etching.

Etching, already described as a part of the process of engraving, as practiced by painters, is classed as a distinct art. The plate is prepared with a ground, and corroded in the same way; but the treatment is more free. Not being tied to the task of literally copying or translating the idea of another, like the engraver, the painter has scope to impart a spirit to his work peculiarly suggestive of what he intends to embody; his idea is represented directly, and not at second-hand. The etchings of Rembrandt, Paul Potter, Karl du Jardin, Adrian Vandevelde, Teniers, Ostade, Berghem, Backhuysen, Van Dyck, Claude, Salvator Rosa, Canaletti, and other painters, are very highly valued, as conveying more completely the feeling of the painter than the best engravings. Etching was more practiced by the old than by modern painters; yet Wilkie, Landseer, and other modern artists, have etched various plates, remarkable for character and spirit.

English Works on Engraving—*Sculpture, or the History and Art of Chalcography and Engraving on Copper*, by John Evelyn (Lond. 12mo 1663; 8vo 1755); *The Art of Engraving and Etching, with the Way of Printing Copper-plates*, by M. Faithorne (Lond. 1702); *Sculptura Historico-technico, or the History and Art of Engraving, extracted from Baldinucci Florent, Le Compt, Faithorne, and other authors* (4to 1747–70); *An Essay upon Prints*, by Gilpin (Lond. 1767–81); Strutt's *Biographical Dictionary of Engravers* (1785); Landseer's *Lectures on Engraving* (1806); *The Origin and Early History of Engraving*, by William Young Ottley (1816); *Histoire de la Gravure*, by George Duplessis (1880); *The Graphic Arts*, by P. J. Hamerton (1882)—a very comprehensive and excellent work.

In the United States various processes have crowded out wood-E. for general purposes as wood-E. some years ago crowded out steel-E. The comparatively small amount of wood-engraving now done for books and periodicals, is for specially important subjects, drawn by artists of the highest repute and cut by the most experienced engravers. There is more co-operation between artists and engravers than formerly; the engraver has become more of an artist, and his work, with that of the draughtsman, has attained a much higher rank as the embodiment of a distinct art. Steel-E. is now confined mostly to bank-note and stock-certificate work. Etching has greatly grown in popularity and is much in demand for frontispieces. It has almost entirely taken the place of steel-E. excepting as above and for portrait work in expensive publications, and is used chiefly for works of art for framing and the portfolio. The *photogravure* process is largely used for art works, mainly copies of paintings; the *Rockwood* and *Albertype* processes reproduce photographic effects in ink; and the *Ives* process, most popular of all, used in book, magazine, and carefully-printed illustrated-paper work, produces the effects of wash drawing and photographs. The photo-E., photo-lithographic, photo-electrotype, heliotype, and countless other zinc, chalk, and gelatine processes, reproduce line work for relief printing, from pen and ink drawings.

Of late years, many inventions have been introduced, having for their object to supersede by machinery and other appliances the slow and laborious manual operations of engraving: see MACHINE-ENGRAVING: MEDALS: GLASS: etc. It is, however, to business and ornamental purposes chiefly that these appliances are applicable, and not to the production of artistic work of the kind treated of in this article. With regard to the reproduction of plates, and other applications of galvanic electricity to engraving, see GALVANISM. MAGNETO-ELECTRICITY: also PHOTOGRAPHIC ENGRAVING.

ENGRAVINGS, PROPERTY OF: right of ownership in engravings and prints, secured by statutes both in the United States and Great Britain, similar to those for the protection of literary property: see COPYRIGHT.

ENGROSS, v. *ĕn-grōs′* [F. *grossoyer*, to write in great and fair letters—from *gros*, big, large: F. *grosse;* Dut. *gros*, a notarial copy]: to copy in a fair large hand—usually said of legal documents. ENGROS′SER, n. one who engrosses. ENGROS′SING, imp.: N. the copying of a writing in fair and legible characters; in *Scotland*, the corresponding term is 'extending a deed.' ENGROSSED′, pp. *-grōst′*. ENGROSS′-MENT, n. the copy in a large fair hand.

ENGROSS, v. *ĕn-grōs′* [F. *engrossir*, to make great, to increase, to enlarge—from F. *gros*, great—the primary signification being to buy up a commodity in order to increase the price]: to make great, thick, bulky, or coarse; to occupy the whole, as the thoughts; to take or assume in undue quantities or degrees. ENGROS′SING, imp.: N. the invidious occupation of anything that should be shared with others. ENGROSSED′, pp. *-grōst′*. ENGROS′SER, n. one who. ENGROSS′MENT, n. the act of appropriating things in undue quantities.—SYN. of 'engross': to absorb; engulf; occupy; swallow up; forestall; monopolize.—ENGROSSING AND REGRATING (known also as Forestalling), an offense against old English laws now abrogated; the act of one who buys grain, flesh, fish, or other articles of food, with the intention of selling them again at an enhanced price, either in the same fair or market, or in another in the neighborhood, or who purchases or contracts for corn while still in the field. These practices were regarded as criminal in most countries, before the laws by which trade is regulated were properly understood. In England, they were forbidden by various statutes, from the time of Edward VI. to that of Queen Anne. These statues were repealed by 12 Geo. III. c. 71, on the preamble, that it hath been found by experience, that the restraints laid upon the dealing in corn, meal, flour, cattle, and sundry other sorts of victuals, by preventing a free trade in the said commodities, have a tendency to discourage the growth, and to enhance the price of the same. It was found, however, that engrossing was not only a statutory but a common law offense, and a prosecution for it in the latter character actually took place in the present century. The Act 7 and 8 Vict. 2. 24. for

abolishing the offenses of forestalling, regrating, and engrossing, was consequently passed. These offenses have not been known to the law in the United States. This English statute also repeals a whole host of earlier enactments in restraint of trade, which had been omitted in the statute in the time of George III., above referred to. The rubrics of these enactments give a curious picture not only of the trading errors, but in many other respects of the obsolete customs of our ancesters. The first, for example (51 Henry III.), is called a 'Statute of the Pillory and Tumbrel, and of the Assize of Bread and Ale.' Then there is an act passed in several reigns which provides for the punishment of 'a butcher or cook that buyeth flesh of Jews, and selleth the same to Christians.'—See MONOPOLY. The statute 6 and 7 Vict. c. 24 does not apply to the spreading of false rumors, with the intent to enhance or decry the price of merchandise, or preventing goods from being brought to market by force of threats, which continue to be punishable as if that act had not been made.

ENGUERA, *ĕn-gwā′râ:* town of Spain, province of Valencia, 43 m. s.w. of the town of Valencia. It is poorly built, and has narrow and irregular streets. It has manufactures of linen and woolens goods, and some trade in cattle and agricultural produce. Pop. 6,358.

ENGUICHÉ, *âng-gē-shā:* term in heraldry. A hunting-horn, the rim around the mouth of which is of different color from the horn itself, is said to be enguiché, of the color in question.

ENGULF, v. *ĕn-gŭlf′*, or INGULF′ [*en*, and *gulf*]: to swallow up; to absorb; to throw into a gulf. ENGULF′ING, imp. ENGULFED′, pp. *-gŭlft′*.

ENHANCE, v. *ĕn-hăns′* [Prov. *anz*, before; *enans*, forward; *enansar*, to put forward, to exalt—from L. *ante*, before: comp. Norm. F. *enhausser*; to exalt]: to raise, as in value or esteem; to advance; to increase; to aggravate. ENHAN′CING, imp. ENHANCED′, pp. *-hănst′*. ENHAN′CER, n. *-sẽr*, one who. ENHANCE′MENT, n. increase; aggravation.

ENHARMONIC, a. *ĕn′hâr-mŏn′ĭk* [Gr. *enarmŏnĭkŏs*, conformed to the rules of harmony—from *en*, in; *harmōnĭă* harmony of sound]: applied to a scale of music proceeding by very small intervals. It is the scale in which the name of a note is changed without any sensible difference of sound, such as C♯ and D♭, F♯ and G♭. Correctly speaking, there is, or should be, a difference; but on keyed instruments, such as the organ and pianoforte, there can be none, as the same key serves for both sharp and flat, while with a just equal temperament the ear is in no way offended. In harmony, the principal seat of enharmonic change is in the chord of the diminished seventh, which, by a change of the notes, may be treated fundamentally in four different ways, without any sensible difference in the intonation.

ENHYDRIS, n. *ĕn-hī′drĭs* [Gr. *en*, in; *hudōr*, water]: in

zool., sea-otter; genus of carnivorous mammals, family *Mustelidæ;* found in the regions bordering the n. Pacific on either side, and is killed for its fur, which is thick and woolly.

ENHYDROUS, a. *ĕn'hī-drŭs* [Gr. *en*, in; *hudōr*, water]: applied to crystals and minerals containing water—the opposite of *anhydrous*.

ENIF, n. *ĕn'ĭf:* the fixed star ϵ Pegasi.

ENIGMA, n. *ĕ-nĭg'mă* [Gr. *ainigma;* L. *ænigma*, obscure speech: F *enigme*]: a riddle; a dark saying, anything obscure or ambiguous. EN'IGMAT'IC, a. *-măt'ĭk*, or EN'IGMAT'ICAL, a. *-ĭ-kăl*, darkly expressed; obscure. EN'IGMAT'ICALLY, ad. *-lĭ*. ENIG'MATIST, n. *-mă-tĭst*, a dealer in engima, one who makes enigmas. ENIG'MATIZE, v. *-tīz*, to utter or form riddles. ENIG'MATIZING, imp. ENIG'MATIZED, pp. *-tīzd*.

ENJOIN, v. *ĕn-joyn'* [F. *enjoindre*—from L. *injungĕrĕ*, to join or fasten into—from *in*, into; *jungo*, I fasten: It. *ingiugnere*]: to command; to order; to bid; to urge. ENJOIN'ING, imp. ENJOINED, pp. *ĕn-joynd'*. ENJOIN'ER, n. one who.

ENJOY, v. *ĕnjoy'* [*en*, and F. *jouir*, to enjoy—from L. *gaudĕō*, I enjoy]: to feel or perceive with pleasure; to take pleasure in the possession of; to possess and use, as an estate. ENJOY'ING, imp. ENJOYED', pp. *-joyd'*. ENJOY'MENT, n. pleasure; satisfaction; possession; possession with pleasure. ENJOY'ABLE, a. *-ă-bl*, that can be possessed with pleasure. TO ENJOY ONE'S SELF, to have pleasure and great satisfaction in.—SYN. of 'enjoyment': gratification; fruition; happiness.

ENKINDLE, v. *ĕn-kĭn'dl* [*en*, and *kindle*]: to inflame; to excite; to rouse into action. ENKIN'DLING, imp. ENKIN'DLED, pp. *-dld*.

ENLARGE, v. *ĕn-lârj'* [*en*, and *large*]: to make larger or greater; to increase in magnitude; to extend; to expand; to amplify; to expatiate; to augment; to set free. ENLAR'GING, imp. ENLARGED', pp. *-lârjd':* ADJ. having liberal and comprehensive views. ENLARGE'MENT, n. increase of size; expansion; release from confinement.—SYN. of 'enlarge': to dilate; distend; increase.

ENLIGHTEN, v. *ĕn-lĭt'n* [Ger. *erleuchten*, to illuminate—from *leuchten*, to lighten]: to shed light on; to illuminate; to instruct. ENLIGHT'ENING, imp. *-lĭt'nĭng*. ENLIGHT'ENED, pp. *-lĭt'nd:* ADJ. supplied with light; intelligent. ENLIGHT'ENER, n. *-lĭt'ner*, one who. ENLIGHT'ENMENT, n. *-lĭt'n-mĕnt*, state of being enlightened or instructed.

ENLIST, v. *ĕn-lĭst'* [*en*, on; F. *liste*, a roll: It. and Sp. *lista*, a strip of paper (see LIST)]: to register; to enroll; to engage in the public service, as in the army; to enter heartily into a cause. ENLIST'ING, imp.: N. the act of engaging men to enter into military service; the act of engaging one's self in a cause. ENLIST'ED,

pp. ENLISTMENT, n. the act of engaging, as a soldier or sailor, or of attaching one's self to a cause; voluntary enrollment. It is the mode by which the army and navy in the United States and in England are supplied with men, as distinguished from the CONSCRIPTION prevailing in many other countries. In the British army, since 1870, men are allowed to enlist for 12 years, with the understanding that 6 years or less shall be passed with the colors, and the remainder with the reserve. In the *U. S. army* there is a bureau of general recruiting service, consisting of a supt. and assistants detailed from the line of the army. It has headquarters in New York, and rendezvous in all principal cities. Recruits thus enlisted are sent to recruiting depots for preliminary instruction. Recruits may enlist for a particular branch of the service; otherwise they are assigned. An officer at each milit. post is detailed as departmental recruiting officer, to enlist men for that post. Each regt. sends out an officer called the regimental recruiting officer, to recruit for that regt. in its immediate vicinity. All recruiting is under charge of the adj.-gen. of the army.

In the U. S. Navy, excepting the force of miscellaneous workmen at the navy yards, enlisted men are needed only when a vessel is going into commission. They ship only for that particular cruise or service, and at its expiration are discharged.

ENLIVEN, v. *ĕn-līv'n* [*en*, to make, and *live*]: to excite; to make vigorous or active; to cheer or gladden. ENLIV'ENING, imp. *-līv'nĭng:* ADJ. invigorating; making sprightly or cheerful. ENLIV'ENED, pp. *-līv'nd.* ENLIV'ENER, n. *-līv'nėr,* one who.—SYN. of 'enliven': to animate; exhiliarate; cheer; inspirit; inspire; invigorate.

ENMESH, v. *ĕn-mĕsh'* [AS. *en*, in, and *mesh*, which see]: to entrap or entangle, as with the meshes of a net.

ENMITY, n. *ĕn'mĭ-tĭ* [from *enemy:* F. *inimitié*—from L. *inĭmicĭtĭă*, enmity: It. *inimicizia*]: ill-will; unfriendly disposition; hostility.—SYN.: aversion; hatred; antipathy; repugnance; ill-will; malice; rancor; malevolence; animosity.

ENNEAGON, n. *ĕn'nĕ-ă-gŏn* [Gr. *ennĕă*, nine; *gōnĭă*, an angle]: a plane figure with nine sides and nine angles. ENNEAG'ONAL, *-al*, relating to an enneagon; having nine angles. ENNEAG'YNOUS, a. *-ăj'ĭn-ŭs* [Gr. *gunē*, a woman]: in *bot.*, having nine pistils. EN'NEAT'IC, a. *-ăt'ĭk*, ninth; also EN'NEAT'ICAL, a. *-ĭ-kăl.* EN'NEAN'DRIAN, a. *-ăn'drĭ-ăn*, or EN'NEAN'DROUS, a. *-drŭs* [Gr. *andră*, a male]: in *bot.*, having nine stamens. In the Linnæan system, the ninth class of plants (having nine stamens) were called *Enneandria;* but this classification has been superseded. ENNEATIC-DAY, *ăt'ĭk*, every ninth day of a disease. ENNEATICAL-YEAR, *-ăl*, every ninth year of a person's life.

ENNEMOSER, *ĕn'nė-mo-zėr*, JOSEPH: 1787, Nov. 15–1854; b. Hintersee, in the Tyrol: medico-philosophic writer.

He commenced his academic studies at Innsbruck 1806; fought in the rising of the Tyrolese against the French 1809; afterward went to Erlangen and then to Vienna, for study. When Napoleon declared war against Russia in 1812, E. was dispatched to England, to solicit aid for the Tyrolese in their meditated insurrection against French domination. He was afterward officer in a Prussian regiment of volunteers, and gathered about him a company of Tyrolese marksmen, who did good service, 1813 and '14. After the peace of Paris, E. went to Berlin, where he finished his studies and, 1816, took his degree doctor of medicine. In 1819, he was made prof. of medicine at the new university of Bonn, where he lectured on Anthropology, Physical Therapeutics, and Pathology. In 1841 he went to Munich, where he obtained great reputation by the application of magnetism as a curative power. Among his many writings his principal work is *Der Magnetismus in seiner geschichtlichen Entwickelung* (Leip. 1819).

ENNIS, *ĕn'ĭs:* municipal borough of county Clare, Ireland, on the Fergus, 20 m. w.n.w. of Limerick. It is a neat town, with some good houses. It has the ruins of a monastery founded 1240 by O'Brien, Prince of Thomond. Near the town is Ennis College, founded by Erasmus Smith. Pop. 5,500.

ENNISCORTHY, *ĕn-ĭs-kawr'thĭ:* market-town in the middle of Wexford county, Ireland, on a rising ground on the Slaney, 14 m. n.n.w. of Wexford. The Slaney is here tidal and navigable for barges, and flows through a fertile and beautiful valley. E. has a large grain-trade. The town arose from a Norman castle, still entire, founded by Raymond le Gros, one of the early Anglo-Norman invaders. Cromwell took E. 1649; and the Irish rebels stormed and burned it 1798, but were defeated a few days later by Gen. Lake. Pop. 5,650.

ENNISKILLEN, *ĕn-ĭs-kĭl'lĕn:* municipal borough of county Fermanagh, Ireland, about 75 m. w.s.w. of Belfast; chief town of the county. It is beautifully situated on the Erne; the greater portion on an isle in the river between the Upper and Lower Loughs Erne. It consists mainly of one undulating street running e. and w. Around, are richly cultivated eminences and many fine mansions. Its two forts command the only pass for 50 m. into Ulster across the Erne. The chief manufactures are cutlery and strawplait. E. is famous for the victory, 1689, of the troops of William III., under Lord Hamilton, over a superior force of James II., under Lord Galmoy. The banners taken in the battle of the Boyne hang in the town-hall. The regt. of Enniskilleners, or 6th Dragoons, was instituted from the brave defenders of the town. Pop. 5,500.

ENNIUS, *ĕn'nĭ-ŭs,* Q.: one of the Roman poets, father of the Roman Epos: B.C. 239–169; b. Rudiæ, in Calabria; probably of Greek extraction. Is said to have

served in the wars, and to have risen to the rank of a centurion. In Sardinia, he became acquainted with Cato the Elder, and returned with him to Rome when about the age of 38. Here he gained the friendship of the most eminent men, among others that of Scipio Africanus the Elder, and attained (what was then exceedingly rare in the case of an alien) rank of a Roman citizen. He supported himself in a decent but humble manner by instructing some young Romans of distinguished families in the Greek language and literature, his accurate knowledge of which explains the influence that he had on the development of the Latin tongue. His remains were interred in the tomb of the Scipios, and his bust was placed among those of that great family. E. has tried his powers in almost every species of poetry, and though his language and versification are rough and unpolished, these defects are fully compensated by the energy of his expressions, and the fire of his poetry. His poems were highly esteemed by Cicero, Horace, and Virgil; the last, indeed, frequently introduces whole lines from the poetry of E. into his own compositions. His memory seems to have been lovingly cherished by his countrymen; *Noster Ennius*, 'Our Ennius,' they used to call him. Of his tragedies, comedies, satires, and particularly of his *Annales*, an epos in 18 books, only fragments are extant. What adds to our regret is, that it is believed his whole works were extant as late as the 13th c. The fragments have been collected and edited by various scholars, among others by Vahlen (1854). The few fragments of his dramas that have come down to us were collected by Ribbeck in his *Scenicæ Romanorum Poesis Fragmenta* (1873). See also the relevant portions of Ribbeck's *Römische Tragödie* (1875); of Sellar's *Roman Poets of the Republic;* and of Simcox's *History of Latin Literature* (1882).

ENNOBLE, v. *ĕn-nō′bl* [*en*, and *noble:* OF. *ennoblir*, to ennoble]: to elevate; to raise to nobility: to exalt; to dignify. ENNO′BLING, imp. *-blĭng*. ENNO′BLED, pp. *-nō′-bld*. ENNO′BLEMENT, n. *-bl-mĕnt*, the act of raising to the rank of nobility.

ENNS, *ens:* river of Austria, rising at the n. base of a branch of the Noric Alps in the crown-land of Salzburg, 12 m. s. of Radstadt. It flows first n. to Radstadt, then n.n.e. to Hieflau, after which it proceeds in a general direction n.n.w., passes Steyer, and joins the Danube near the town of Enns, 11 m. below the town of Linz, after a course of about 120 m. Its chief affluents are the Salza and the Steyer. For the last 15 m. of its course, the E. forms the boundary between Upper Austria (Ober der Enns) and Lower Austria (Unter der Enns). The scenery on the banks of the E. is in general bold and romantic, as it flows, for the most part, between parallel mountain-chains, lofty and precipitous. In its lower course, it becomes navigable, but is important chiefly from the valuable water-power which it supplies.

ENNUI, n. *ŏng nwē′* [F. *ennui*, weariness—from Sp. *enojo* —from mid. L. *inōdĭō*, weariness: comp. Gael. *ain-uidh*, a

listless state of mind]: heaviness; lassitude; languor or weariness from want of employment.

ENNUYE: see ENNUI.

ENOCH, *ē'nok:* son of Jared, and father of Methuselah. A peculiarly mysterious interest attaches to him on account of the supernatural manner in which his earthly career terminated. We are told by the writer of Genesis, that E. 'walked with God 300 years . . . and he was not; for God took him.' What the statement 'he was not' signified to the later Jews, is explained by the writer of the Epistle to the Hebrews: 'Enoch was translated that he should not see death.' E. and Elijah are the only human beings on record who were not required to discharge the debt which mortals owe to nature. It may naturally be supposed that E. was a character on whom the extravagant fancy of the later Jews would fasten with unusual pleasure. As they came more and more into contact with Grecian and other culture, they felt the necessity of linking on the arts and sciences of Gentile nations to their own history, if they would continue to preserve that feeling of supremacy which was so dear to their pride as the chosen people. Hence, in later traditions, E. appears as the inventor of writing, arithmetic, astronomy, etc., and is affirmed to have filled 300 books with the revelations which he received, the number 300 being obviously suggested by the number of years during which he is said to have walked with God.

Another ENOCH in Scripture, was the eldest son of Cain; he built a city or hamlet which was called by his name.

E'NOCH, BOOK OF: ancient apocalyptic work, of date not precisely known, but probably of about the middle of the 2d. c. B.C.; written originally it is probable, in Aramaic, by a native of Palestine. At subsequent periods, it seems to have been enlarged by additions and interpolations. It is divided into five parts: the *first* discourses of such subjects as the fall of the angels, and the journey of E. through the earth and through Paradise in the company of an angel, by whom he is initiated into the secrets of nature, etc.; the *second* contains E.'s account of what was revealed to him concerning the heavenly or spiritual region; the *third* treats of astronomy and the phenomena of the seasons; the *fourth* represents E. beholding, in prophetic vision, the course of Divine Providence till the coming of the Messiah; and the *last* consists of exhortations based on what has preceded. The book—which illustrates the traditions which had grown up around the name of the mysterious Enoch of Genesis—was current in the primitive church, and was quoted by the Fathers, as it had been quoted by the apostle Jude, as any book might be quoted for a single fact without at all authenticating the book as a whole. It never approached a place among canonical books, and was lost sight of by Christian writers about the close of the 8th c., so that until last c. it was known only by extracts. Fortunately, however, the traveller Bruce discovered in Abyssinia three complete

MSS. of the work, which he brought to England 1773. These MSS. proved to be an Ethiopic version made from the Greek one, in use among the Fathers, as was evident from the coincidence of language. The Ethiopic version did not appear till 1838, when it was published, by Abp. Lawrence. An English translation, however, by the same writer, had appeared 1821, which passed through three editions, and formed the basis of the German edition of Hoffmann (Jena 1833–38). In 1840, Gfrörer published a Latin translation of the work; but by far the best edition is that of Dr. A. Dillmann, who, 1851, published the Ethiopic text from five MSS.; and in 1853, a German translation, with an introduction and commentary. An English translation, with notes, was published 1882 by Professor Schodde, of Ohio.

ENODE, a. *ĕ-nōd′* [L. *ex*, out of ; *nōdŭs*, a knot]: in *bot.*, without knots or joints.

ENOPLA, n. *ĕn′o-pla* [Gr. *enoplos*, in arms, armed: so named from the armature of the mouth or pharynx]: in *zool.*, a tribe of annuloida, order *Turbellaria*, having the mouth or pharynx armed with styles, hooks, or rods. They consist of minute animals, inhabiting fresh or salt water.

ENORMOUS, a. *ĕ-nŏr′mŭs* [L. *enormis*, irregular—from *ex*, out of; *norma*, a rule: F. *énorme*]: great beyond ordinary measure; excessive; vast; huge; heinous. Enor′mously, ad. *-li*. Enor′mousness, n. immeasurable excess; hugeness. Enor′mity, n. *-mĭ-tĭ*, anything very vicious or sinful; an atrocious crime; any villainy or crime that exceeds the common measure.—Syn. of 'enormous': prodigious; immoderate; immense; inordinate; outrageous; atrocious: detestable.

ENORTHOTROPE, n. *ĕn-awr′tho-trōp* [Gr. *en*, in; *orthos*, straight; *trepō*, I turn]: toy that depends for its action upon the persistence of visual impressions. Upon different parts of a card are detached parts of a figure, and when the card is rotated these become assembled and give a combined impression to the eye, showing the figure complete.

ENOS, *ē′nos* (anciently, *Ænos*): ancient town and seaport of European Turkey, province of Adrianople, on a rocky isthmus at the mouth of the Gulf of Enos, abt. 35 m. w.n.w. of Galipoli. It is the port of Adrianople, and has some trade in wool, camels' hair, cotton, leather, silk, etc. Its harbor is commodious, but so shallow, from being choked with sand, that it admits only small vessels. Pop. 8,000, principally Greeks.—The Gulf of Enos is about 2½ m. wide at the entrance, extends inland about 14 m., and is on an average 5 m. broad. The town of E. is very ancient. Virgil mentions it (*Æn.* iii. 18) as being one of the towns founded by Æneas, after the sack of Troy; and Homer attests its antiquity by alluding to it in his great poem (*Il.* iv. 519).

ENOSTOSIS, n. *ĕn′ŏs-tō′sĭs* [Gr. *en,* in; *ostĕŏn,* a bone]: a bony tumor growing inward into the medullary canal of a bone: see EXOSTOSIS.

ENOUGH, a. *ē-nŭf′* [AS. *genoh,* sufficient: Goth. *ganauhan,* to suffice; *ganohs,* enough: Icel. *gnogr,* abundant: Ger. *genug;* Dut. *genoeg,* enough]: that gives content; that satisfies desire; sufficient: N. a sufficiency; a quantity that satisfies desire or need: AD. sufficiently; fully; sometimes it denotes a slight increase or augmentation, as, he is *ready enough* to oblige; sometimes it expresses indifference or slight, as, the music is *well enough,* that is, not so good as it should be; used as an exclamation, to denote fulness or satiety, as, *enough.* ENOW, n. *ē-now′,* sometimes used for *enough* with a plural meaning.

EN PASSANT, *âng′ pâs-sâng′* [F. *en,* in; *passant,* passing]: cursorily; by the way.

ENQUIRE, v. *ĕn-kwīr′:* see INQUIRE.

ENRAGE, v. *ĕn-rāj′* [*en,* in, and *rage:* F. *enrager*]: to provoke; to excite to anger; to exasperate; to make furious. ENRA′GING, imp. ENRAGED′, pp. *-rājd′*.—SYN. of 'enrage': to inflame; incite; anger; irritate; incense.

ENRAPT, a. *ĕn-răpt′* [*en,* in, and *rapt*]: ravished; thrown into an ecstasy; carried away with emotion. ENRAP′TURE, v. *-tūr* [*en, rapture*]: to transport with pleasure or delight. ENRAP′TURING, imp. ENRAP′TURED, imp. ENRAP′TURED, pp. *-tūrd,* transported with delight.

ENRAVISH, v. *ĕn-răv′ĭsh* [*en, ravish*]: to transport with delight; to fill with the highest degree of pleasure; to enrapture. ENRAV′ISHING, imp. ENRAV′ISHED, pp. *-ĭsht,* carried away with pleasure or delight.

ENRICH, v. *ĕn-rĭch′* [F. *enrichir: en,* and *rich*]: to make rich; to supply or furnish with wealth or property; to fertilize, as land; to supply with anything desirable; to store, as the mind; to adorn, as with carving or painting. ENRICH′ING, imp. ENRICHED′, pp. *-rĭcht′*. ENRICH′MENT, n. that which enriches; augmentation of wealth.

ENRIQUEZ, *ĕn-rē′kĕth,* GOMEZ ANTONIO (properly, ENRIQUEZ DE PAZ): Spanish poet; b. Segovia, early in the 17th c.; date of death unknown.; son of a baptized Portuguese Jew. He entered the army in his 20th year, and rose to the rank of captain; but 1636, had to flee the country to escape the persecution of the Inquisition, which suspected him of a secret leaning to the creed of his father. Enriquez settled at Amsterdam, and latterly professed the Jewish faith; in consequence of which, he was burned in effigy by the pious Rom. Catholics of Seville, 1660, Apr. 14. During his residence in Spain, Enriquez had considerable reputation as a dramatic poet. According to his own account, he wrote 22 comedies, which had great success on the stage, in consequence of which, several of them passed as Calderon's. Enriquez's comedies show him to have possessed much inventiveness, but in other respects deserve little praise. For notice of Enriquez and his writings, see Ticknor's *History of Spanish Literature.*

ENROBE, v. *ĕn-rōb′* [*en, robe*]: to clothe; to invest; to attire. ENRO′BING, imp. ENROBED′, pp. *-rōbd′*.

ENROCKMENT, n. *ĕn-rŏk′mĕnt:* stone thrown upon the sea-face of a breakwater or dike, or a shore subject to encroachment of waves or stream.

ENROLL, or ENROL, v. *ĕn-rōl′* [F. *enrôler: en,* and *role*]: to insert a name in a register or list; to record. ENROL′LING, imp. ENROLLED′, pp. *-rōld′*. ENROL′LER, n. one who. ENROL′MENT, n. [F. *enrôlement*]: the act of enrolling or entering into a register; a registering.

ENSAMPLE, n. *ĕn-săm′pl* [OF. *ensample*—from L. *exemplum*]: old form of EXAMPLE, which see.

ENSANGUINED, a. *ĕn-săng′gwĭnd* [*en,* and L. *sanguĭnem,* blood]: soaked or stained with blood.

ENSATÆ, n. *ĕn-sā′tē* [L. *ensis,* a sword]: in *bot.,* name given by Linnæus to an order of plants containing the genera Iris, Xyris, etc. In 1805 Ker gave this name to what are now called *Iridaceæ*—a more restricted use than that of Linnæus.

ENSCHEDE, *ĕn-schā′dė:* town in the Netherlands, province of Overyssel, four m. from the Hanoverian boundary, 30 m. w.n.w. of Zutphen. Besides fustians and dimities, cottons for export to Java are largely manufactured. Cotton-spinning, bleaching, dyeing, and calendering also employ many of the inhabitants. There are several benevolent institutions; a Reformed, a Rom. Cath., a Bapt. church; a Chamber of Trade, and grammar-school, in which French, English and German are taught. Pop. (1890) 15,615.

ENSCONCE, v. *ĕn-skŏns′* [*en,* in; Dut. *schantse,* a rampart made of trees and branches: Ger. *schanzen,* to make a fence: OF. *esconser,* to hide; *esconse,* a dark lantern (see SCONCE)]: to put one's self behind a screen of some kind; to shelter or cover; to protect; to secure. ENSCON′CING, imp. ENSCONCED′, pp. *-skŏnst′*.

ENSEMBLE, n. *âng-sâm′bl* [F. *ensemble,* the whole—from L. *insĭmul,* at the same time]: the whole so seen that each part is only viewed in reference to the whole; details of anything viewed with relation to each other; the general grouping of characters in dramatic art to form a picture on the fall of the curtain; whole effect of the various parts of a musical performance. TOUT ENSEMBLE, *tût-* [F. *tout,* all —from L. *totus,* the whole]: the whole together; the general appearance or effect.

ENSHRINE, v. *ĕn-shrīn′* [*en,* and *shrine*]: to inclose in a covering or chest; to preserve as sacred. ENSHRI′NING, imp. ENSHRINED′, pp. *-shrīnd′*.

ENSHROUD, v. *ĕn-shrowd′* [*en,* and *shroud*]: to cover or envelop in a shroud. ENSHROUD′ING, imp. ENSHROUD′ED, pp.

ENSIFORM, a. *ĕn′sĭ-fawrm* [L. *ensis,* a sword; *forma,* a shape]: in *bot.,* in the form of a sword, as the leaves of

the gladiolus; in *anat.*, applied to the xiphisternum or cartilage in which the breast-bone ends.

ENSIGN, n. *ĕn'sīn* [F. *enseigne;* OF. *ensigne,* a distinctive mark—from L. *insĭgnĭă,* plu. of *insĭgnĕ,* that has a mark upon it, distinguished—from L. *en,* in; *signum,* a mark impressed]: the banner or flag of a regiment; formerly the infantry officer who carried the flag of a regiment, now designated simply as second lieutenant; a mark of rank or office; the national flag of a ship. EN'SIGNCY, n. *-sĭ,* the rank or commission of an ensign.—*Ensign* was, until 1871, the title of the lowest commissioned officers in the British army, from their carrying the regimental colors or ensign. In the hand-to-hand mêlées of the middle ages, the preservation of the colors or standard, as the rallying-point of those fighting under the same leader, was a matter of vital importance and was intrusted only to the bravest and most trustworthy. The colors were committed to him with imposing ceremony in presence of the assembled regiment, and he had to take an oath to defend them with life and limb, and if need were, to wrap himself in them as a shroud and devote himself to death. The man who undertook this perilous post received sometimes sixfold the usual pay. It was doubtless in this way that the point of honor arose respecting the colors. History records repeated instances where the oath was kept to the letter. In the modern system of warfare, the regimental colors are seldom exposed to such danger, and the office of ensign is of less account. The rank of ensign has been abolished in the British army.—ENSIGN is the name also of a flag used to denote the nation to which the ship belongs; it is a large flag or banner hoisted on an ensign staff, a long pole erected over the poop, or at the gaff when the ship is under sail. The English ensign has for a groundwork one of three colors—red, white, or blue—and bears the Union double cross of St. George and St. Andrew, or Union Jack (q. v.), in the upper corner next the mast (dexterchief). The *white* ensign also is divided into four quarters by a red cross of St. George, and is limited to ships-of-war. Merchant-vessels are allowed to carry only the *blue* ensign; but yachts, if of clubs acknowledged by the admiralty, colonial armed vessels, ships connected with government departments, and merchant-vessels commanded by officers of the Naval Reserve, are permitted to use the *red* ensign. Formerly, the English admirals required ships of all other nations to dip their ensigns to the English flag: the refusal of the Dutch to comply with this custom, was the signal for one of Blake's bloodiest encounters with Van Tromp.

In the *U. S. army,* the national and regimental flags are carried by sergeants selected by the col., and the troop and battery guidons by corporals selected by the captains: see COLOR (COLOR-GUARD: COLOR-SERGEANT); also FLAG; STANDARD. In the *United States navy,* the national flag is the ensign. Merchant vessels also carry the flag of the nation.

ENSILAGE: process of preserving green forage in an air and water-tight excavation or building called a silo. The term is applied also to the material thus preserved. The process is of ancient and unknown origin. There is evidence that the Romans stored green forage, as well as ripened grain, in pits which they covered with earth; but whether they discovered this method or adopted it from some of their conquered tribes is uncertain.

The forage (green corn, grass, etc.) should not be allowed to wilt, but should be removed from the field as soon as cut, and run through a machine which will divide it into short pieces. From four to five-tenths of an inch is probably the best length, as the ensilage packs more closely and requires less pressure than it does when cut in inch or inch and one-half pieces. The machine should be located so that an endless belt will deposit the material in the silo as fast as it is cut. It should be evenly spread and, in order to cause it to settle uniformly, may be lightly tramped at the sides and corners.

Silage, as the preserved fodder is called, is of two kinds, 'sweet' and 'sour.' The former is obtained by allowing it to ferment uncovered until it becomes heated to 52°–60° C. (about 125°–150° F.); this temperature kills the acid-forming bacteria and the silage is, therefore, rich in sugar. Should the cover be applied immediately after the fodder has been stacked in the silo, the fermentation proceeds further, the sugar is largely converted into lactic acid (corn) or into alcohol, aldehyde and acetic acid (grass), so giving the 'sour' variety. Other changes take place especially in the nitrogenous constituents, the general tendency being to diminish the food value of the silage as compared with the original green fodder. The value of ensilage depends essentially on the fact that a crop can be preserved even in damp weather when it will not ripen, or when it cannot be dried into hay. Pressure is applied to the cover of the silo either by weights or by screws, the object being to keep the mass compact so as to exclude air and thus prevent the vegetable matter from decaying. ENSILATE, v. *ĕn'sĭl-āt*, to bury grain, green fodder, or forage crops in a foss or trench for the purpose of preserving them.

ENSISTERNAL, a. *ĕn-sĭ-stėr'nal* [L. *ensis*, a sword; mod. L. *sternum*—from Gr. *sternon*, the breast or chest]: in *anat.*, pertaining or relating to the ensiform process of the sternum.

ENSLAVE, v. *ĕn-slāv'* [*en*, and *slave*]: to deprive of liberty; to reduce to bondage; to hold in subjection. ENSLA'VING, imp. ENSLAVED', pp. *-slāvd'*. ENSLA'VER, n. one who. ENSLAVE'MENT, n. state of being enslaved bondage.

ENSNARE, v. *ĕn-snär'* [*en*, and *snare*]: to entrap; to take by guile. ENSNA'RING, imp. ENSNARED', pp. *-snärd'*: also INSNARE: see INSNARE.

ENSNARL, v. *ĕn-snârl'* [en, and *OE. snarl*, Scot.

snorl, a difficulty, a snare]: in *OE.*, to entangle, as thread; to entangle; to insnare. ENSNARL′ING, imp. ENSNARLED′, pp. *-snârld′*.

ENSTATITE, n. *ĕn′sta-tīt* [Ger. *enstatit*—from Gr. *enstatēs*, an adversary: so named because so refractory]: in *mineral.*, an orthorhombic mineral. Its lustre is vitreous, except on the cleavage surfaces, on which it is pearly; colors are white, green, or brown; streak is gray. It is possessed of double refraction; composition; silica, 60 magnesia, 40. There are two varieties: (1) enstatite proper, white, with little or no iron; chladnite falls under this; (2) Ferriferous enstatite, called also bronzite; containing iron; green or brown; found in Bavaria, Moravia, Pennsylvania, Texas, and elsewhere.

ENSUE, v. *ĕn-sū′* [OF. *ensuir*, to ensue: F. *ensuivre*, to follow—from L. *insĕquī*, to follow upon—from *in*, in; *sĕquor*, I follow]: to follow as a consequence; to succeed; to come after. ENSU′ING, imp.: ADJ. coming next after; following as a consequence. ENSUED′, pp. *-sūd′*.

ENSURE, v. *ĕn-shôr′*: see INSURE.

ENTABLATURE, n. *ĕn-tăb′lă-tūr*, or ENTABLEMENT, n. *ĕn-tăb′l-mĕnt* [OF. *entablature;* F. *entablement*—from *en*, in;

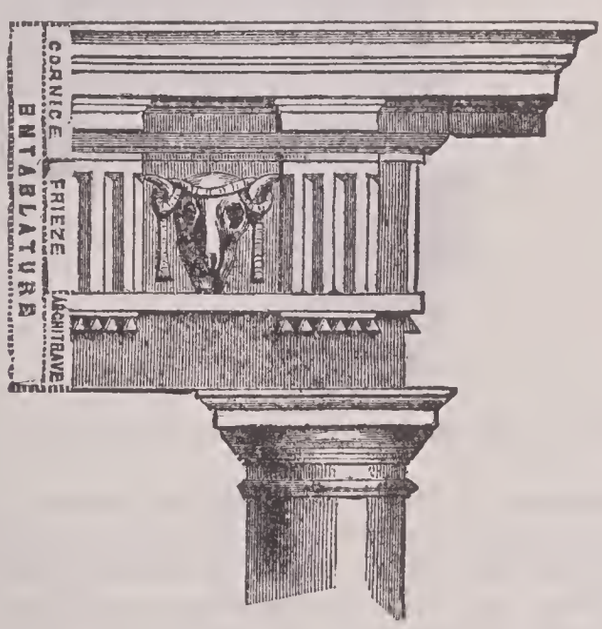


Fig. 1.—Example of Doric Entablature.

L. *tabŭlă*, a board or table]: in *classic architecture*, that part of a design which surmounts the columns (q. v.), and rests upon the capitals. It is usually about two diameters of the column in height, and is divided in every style of classical architecture into three parts—architrave, frieze, and cornice. These parts vary in their relative proportions in different styles. In Doric architecture, for example, if the entablature be divided into eight equal parts, two of these form the height of the architrave, three that of the frieze, and three that of the cornice. In the other styles, the relative proportions are as three, three, and four.

ENTABLATURE.

The term entablature was not used till the 17th c., the members composing it being previously simply designated the cornice, frieze, and architrave.

1. *The Architrave* is the horizontal portion which rests immediately upon the abacus of the column. It is usually ornamented with horizontal moldings, with flat spaces or *fasciæ* between. The upper molding always projects further than the others, so as to throw off the rain. This molding varies in different styles. In Doric (fig. 1), it is a plain square projection, with small pendants or *guttæ* under the triglyphs. In the other styles it is generally an ogee, or talon molding. These moldings are frequently enriched with leaf ornaments, and in very florid designs the faciæ also are enriched.

2. *The Frieze* is the middle portion of the entablature, between the top of the architrave and the bed of the cornice. In the Doric style, it is ornamented with triglyphs or

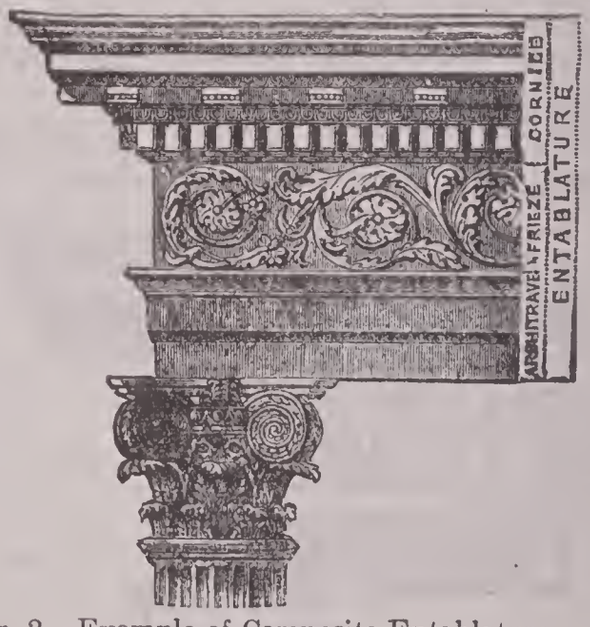


Fig. 2.—Example of Composite Entablature.

slight projections, divided by angular grooves into three parts. The spaces between the triglyphs (called metopes) are square, and are either plain or enriched, either with figure-sculpture, as in the Parthenon, or with bulls' heads, pateræ, or other ornaments. In the other styles, the frieze is never cut into portions, but is either left quite plain or ornamented with figure-sculpture or scroll-work. The former is usual in Greek art, the latter in Roman. In late Roman works, the frieze is sometimes *swelled* or made to project with a curve.

3. *The Cornice* forms the upper portion of the entablature. It is divided into several parts. The lower molding or moldings resting on the frieze are called the bed-moldings—the upper projecting part is called the corona (q.v.), and between the two there are frequently introduced modillions and dental bands. The bed-molding is generally of an oval or echinus form, and is frequently

enriched with the egg and tongue or leaf ornaments. The upper molding of the corona is generally of a *cyma recta* form (see COLUMN, fig. 1), and is often ornamented with lions' heads. These represent the openings through which the rain was at first led off from the roof-gutters, which were cut in the top of this molding, and were retained as ornaments after their original use was discontinued. The corona projects well over the frieze and architrave, and protects them from rain, while by its broad shadow, it gives repose and variety of effect to the building. The *soffit*, or underside of the corona, is frequently panelled and ornamented with pateræ.

Origin.—The component parts of the entablature are said, with some appearance of truth, to owe their origin to the forms of the construction of the oldest temples. These were of wood, and were put together in the manner most natural for that material. The square beams laid across from post to post are represented by the architrave; the triglyphs of the frieze are copied from the ends of the cross-beams; the cornice is taken from the boarding which covered the rafters and ties of the roof—projected so as to throw off the rain; and the dentils and modillions show the ends of the rafters left uncovered.

Whatever the origin of the entablature, it is remarkable as connected with Greek and Roman art, how persistent the entablature was as a feature in the decoration of these classic styles. So long as buildings consisted of one story in height, this was quite natural; but after this simple system was abandoned, and when, as in Roman architecture, series of columns and entablatures were piled one above the other—not used constructionally, but simpy applied to the face of the building—the cornice, frieze, and architrave still retained their places and proportions. In the revived Roman art of the 16th c., the entablature was used in a manner still further removed from its original purpose (fig. 2.). The strict proportions of the various parts were entirely lost sight of. The frieze was increased in height, so as to admit of small windows, to light the entresol or Mezzanine (q.v.), and in the French and English forms of the renaissance, the various members become still more attenuated and altered from the original design (see RENAISSANCE). But in no modification of classic architecture, however debased, is the entablature lacking. The architrave, frieze, and cornice are essential portions of every classic design.

ENTADA, *ĕn-tā′da:* genus of climbing shrubs of the nat. ord. *Leguminosæ*, suborder *Mimoseæ*, having pinnate or bipinnate leaves, and remarkable for their great pods, in which the seeds lie amidst a glutinous or gelatinous substance. The seeds of *E. pursætha*, an East Indian species, are saponaceous, and the plant attains great size, sometimes having pods five ft. long and six inches broad.

ENTAIL, v. *ĕn-tāl′* [F. *entailler*, to cut, notch, or carve —from *en; tailler*, to cut—*lit.*, to cut from the power of a testator, as to the disposal of an estate]: to fix the succes-

sion of lands or tenements to a certain line of descendants, so that the one in possession can neither sell nor burden them except by legal process under an act of parliament, and with the consent of the next two heirs; to fix as an inevitable consequence on persons or things: N. lands or tenements limited in descent; the settled rule of descent for an estate. ENTAIL′ING, imp. ENTAILED′, pp. *-tāld′:* ADJ. settled on a person and his descendants. ENTAIL′MENT, n. the act of settling inalienably an estate on a person and his heirs.

ENTAIL, or ENTAYLE, v. *ĕn-tāl′* [It. *intaglio*, which see]: in *OE.*, to carve: to cut: N. a stone or gem with the design cut out or hollowed; in *old English authors*, any architectural ornament, sculptured or cut in stone; an intaglio. ENTAIL′ING, imp. ENTAILED′, pp. *-tāld′*.

ENTAIL′ (frequently called in Scotland, *tailzie*): any destination by which the legal course of succession is cut off, one or more of the heirs-at-law being excluded or postponed, and the settlement of land made upon a particular heir or series of heirs. The desire to preserve in a family land which has been either inherited or acquired, appears inherent in the human mind. The first distinct trace of the existence of entails, is found in the Roman law. The Greeks, indeed, permitted persons to name successors to their estates, and to appoint a substitute who should take the estate on the failure of him first named. The substitute, as appointed, was permitted to succeed on the death of the institute (as he was called) without leaving issue or without alienating the estate. But this limited right fell far short of the power of entailing which has since prevailed in various countries. At Rome, under the later emperors, the practice of settling land upon a series of heirs, by means of *Fideicommissa* (q.v.), grew up, and was sanctioned by the state. These deeds, which were originally simply a trust reposed in the honor of a friend, to whom the property was conveyed, to carry out the will of the grantor, by degrees received the sanction of the law. In their early form, they contained merely a substitution of heirs. But by the later law, a much fuller form of settlement was admitted, whereby the estate was protected from every sort of alienation. It is impossible to doubt that the later Roman form must have been adopted by the Scottish lawyers in framing their deeds of entail. The limitation to a particular line of descent, the prohibition to alienate or burden with debt, and the still more peculiar feature of the declaration of forfeiture in case of non-compliance, are in both forms. There are, however, two points in which the Roman law differed from that which prevailed for many years in Scotland—viz., that the former did not recognize the right of primogeniture, and that after the legislation of Justinian, the limitation of the deed was restricted to four generations. The right of primogeniture as recognized in deeds of entail, originated with the feudal law. That system, which has united with the civil law to form a basis for the codes of modern Europe, did not, in

its original form, recognize the right of a holder of land to alienate his feudal benefice, or even to alter the succession, because on the failure of heirs the feud returned to the superior. But the right of the eldest son to represent his father, both in the duties and in the privileges of the fief, if not an original principle of the system, was universally recognized in the days of its greatest power. We shall presently see how this principle was embodied in a Scottish deed of entail.

In England, the Saxons, it is said, prohibited the alienation of lands by those who had succeeded to them under condition that they should not alienate.—Wilkins's *Leges Saxonicæ,* p. 43 (note). Among the Saxons, the law of primogeniture was not recognized. But on the establishment of the feudal laws in England, a practice began to prevail whereby an estate was settled upon a particular series of heirs. The judges, however, refused to recognize an absolute limitation of the estate to a particular line of heirs, but held the destination to be conditional on the birth of an heir, and that that condition having been fulfilled, the donee was free to alienate the estate. The common law thus refusing to recognize entails, a statute was passed which had the effect of introducing that practice into England. This was the famous statute *De Donis* (see DONIS CONDITIONALIBUS). One of the forms of entail under this statute was by settlement in Frankmarriage (q.v.). For nearly 200 years the statute *De Donis* was operative for strict entail. But the tendency which in Scotland was to strengthen the power of entails, was in England in the opposite direction. For a long time tenants in tail, through legal technicalities, were able to defeat the limitation in tail by means of a Discontinuance. For more than 300 years from the introduction of common recoveries, entail could be barred if the tenant in tail and the next heir chose to combine to defeat it. In 1833 the technicalities formerly necessary were removed, and a tenant in tail may now, by simple conveyance, alienate his estate at pleasure, at least where there is a possibility of issue. Under the modern settlement where the estate tail is preceded by a life interest, the consent of the tenant for life is required to bar remainders and reversions. An estate tail is a freehold of a limited nature. Tenant in tail may commit waste. An estate tail is liable to the debts of the tenant. Copyhold lands have been held not to fall under the operation of the statute *De Donis.* The laws against Perpetuities (q.v.) prevent tying-up of property for an indefinite period; but in fact family estates are usually resettled by the owners in each generation. Lord Cairns's Settled Land Act, 1882, has given to tenants for life absolute power of sale on notice to the trustees of the settlement, and without petition to the court, the price being invested for the persons interested under the settlement. By a series of statutes in England, tenants for life have also received large powers of managing and improving their estates.

In America, before the separation from the mother-country, the English law as to estates tail prevailed. But in the United States, the law of E. has been gradually abandoned by the several states; and property can now be fettered, to a very limited extent only, by executory devises (q.v.). In France, the power of creating E. has varied much at different periods, from the right to make a perpetual E., which appears to have been the original principle, to a limitation to four, and at one time to two degrees. But by the Code Napoleon, ss. 896–897, entails are now absolutely prohibited. In Spain, also, entail, formerly permitted under certain restrictions, were abolished 1820.

See M'Culloch's *Treatise on the Succession to Property vacant by Death;* Williams's *Principles of the Law of Real Property;* Sandford's *History and Law of Entail in Scotland; Reports by H. M. Consuls on Systems of Land Tenure,* 1870; and *Cobden Club Essays*, on same subject. See also Lavaleye, *De la Propriété primitive,* and Garsounet, *Histoire des Locations perpétuelles.*

ENTANGLE, v. *ĕn-tăng'gl* [*en*, in, and *tangle*]: to twist and intermingle; to involve; to confuse; to bewilder; to puzzle; to perplex. ENTAN'GLING, imp. *-glĭng.* ENTAN'GLED, pp. *-gld.* ENTAN'GLEMENT, n. *-gl-mĕnt*, a disordered state; perplexity; military obstacles formed by bending down and picketing a series of adjacent saplings, with large trees partly cut down, or with wire passed over stout stakes set at different distances.

ENTASIA, n. *ĕn-tā'zhĭ-ă* [Gr. *entăsis*, distension, a violent straining]: in *med.*, a vehement straining or stretching—applied as a general term for constrictive spasm, tetanus, etc. ENTAS'TIC, a. *-tăs'tĭk*, relating to diseases characterized by tonic spasms. ENTASIS, n. *ĕn'tă-sĭs*, in *arch.*, the gradual swelling outline given to a shaft or column (q.v.).

ENTELECHY, n. *ĕn-tĕl'ĕ-kĭ* [Gr. *entelecheia*—probably from *en telei echein*, to be complete or absolute]: term introduced by Aristotle to signify actual as distinguished from merely potential existence; the first of which he defined as the state of being complete or finished; the second, as the activity of that which is thus complete. Entelechy in *mod. phil.*, is the name which Leibnitz gave to the monads of his system.

ENTELLUS MONKEY, *ĕn-tĕl'ŭs*, or HANUMAN, *hŏn'-ū-măn* (*Semnopithecus Entellus*): East Indian species of monkey, with yellowish fur, face of violet tinge, surrounded with projecting hairs, long limbs, and very long muscular and powerful—though not prehensile—tail. It is held in superstitious reverence by the Hindus, and is often seen exhibiting much impudent familiarity in the precincts of temples; indeed, temples are often specially dedicated to it; hospitals are erected for its reception when sick or wounded. Hindu laws affix a far more severe punishment to the slaughter of one of these sacred monkeys

than of a man; the peasant esteems it an honor when his garden is plundered or his house robbed by troops of them, and would consider it an act of the greatest sacrilege to drive them away. This is one of the very few species of monkeys found in the n. provinces of India, and in summer it ascends the Himalaya to the pine-forests, and almost to the snow-line; it has even succeeded in crossing the mountains, and occurs in Bhotan.

ENTER, v. *ĕn-tėr* [F. *entrer*—from L. *intrārĕ*, to walk into, to enter: F. *entre;* L. *iuter*, between, among: It. *entrare*]: to go or pass into a place; to begin; to engage in; to join or become a member of; to set down in writing; to enroll; to flow into; to pierce. EN′TERING, imp.: N. a passing in; an entrance. EN′TERED, pp. *-tėrd:* ADJ. enrolled; introduced. EN′TRANCE, n. *-trăns*, power or right to enter; the door; the beginning: ADJ. that which allows to enter: preliminary. ENTRANT, n. *ĕn′trănt*, one who enters. ENTERCLOSE′, *-klŏz′*, in *arch.*, passage between two rooms in a house, or leading from the door to the hall. To ENTER SHORT, to pay a bill not due into a bank merely for collection, and not for entry to the credit of any account.

ENTERIC, a. *ĕn-tĕr′ĭk* [Gr. *entĕrŏn*, an intestine]: belonging to the intestines. ENTERIC FEVER, typhoid fever. EN′TERI′TIS, n. *-ī′tĭs* [*itis*, a postfix denoting inflammation]: inflammation of the intestines. ENTER′OCELE, n. *-ō-sēl* [Gr. *kēlē*, a tumor]: a hernial tumor containing a loop of the intestine. ENTEROCYS′TOCELE, n. *-sĭs′tō-sēl* [Gr. *kystis*, a bladder; *kēlē*, a tumor]: hernia affecting the bladder and an adjacent portion of the intestine. ENTERO-EPIP′LOCELE, n. *-ĕ-pĭp′lō-sēl* [Gr. *epiploön*, the omentum; *kēlē*, a tumor]: hernia containing both omentum and intestines in the sac. ENTEROGRAPHY, n. *-ŏg′rā-fĭ* [Gr. *graphē*, a writing]: branch of anatomy which describes the intestines. ENTERO-HY′DROCELE, n. *-hī′drō-sēl* [Gr. *hudōr*, water; *kēlē*, a tumor]: hernia, complicated with hydrocele. EN′TEROLITH′, n. *-ō-lĭth′* [Gr. *lithos*, a stone]: a concretion resembling a stone found in the intestine. ENTEROLOGY, n. *ĕn′tėr-ŏl′ŏ-jĭ* [Gr. *logos*, discourse]: a treatise or discourse on the internal parts of the body. ENTEROMER′OCELE, n. *-mĕr′o-sēl* [Gr. *mēros*, the upper fleshy part of the thigh; *kēlē*, a tumor]: crural hernia, formed by the adjacent intestine. ENTEROMESENTER′IC, a. *-mĕs ĕn-tĕr′ĭk*, pertaining or relating to the mesentery and to the intestines. ENTEROMORPHA, n. *en-tėr-ō-mawr′fa* [Gr. *morphē*, form, shape]: genus of algals, order *Confervaceæ*, tribe or family *Acetabularidæ*. Some are marine, some fresh-water species, while one, *E. intestinalis*, grows both in the sea and in fresh water. EN′TEROM′PHALOS, n. *-ŏm′fă-lŏs* [Gr. *ŏm-phălos*, navel]: an umbilical hernia whose contents are intestine. ENTEROP′ATHY, n. *-ŏp′a-thĭ* [Gr. *pathē*, passive state, suffering]: disease of the intestines. ENTEROPERIS′TOLE, n. *-pĕrĭs′to-lē* [Gr. *peristolē*, a dressing out or up]: strangulation of part of the intestine in a hernia or otherwise. ENTER-

OPTOSIS, downward displacement of the abdominal organs, associated with neurasthenic symptoms. (See SPLANCNOPTOSIS). ENTERORPHAPH'IA, n. *-răf i-ă* [Gr. *raphē*, a seam, a suture]: suture of part of the intestines, which has been ruptured or otherwise divided. ENTEROSAR'COCELE, n. *-sâr'ko-sēl*, intestinal hernia, complicated with sarcocele. ENTEROS'CHEOCELE, n. *-ŏs'kē-o sēl* [Gr. *oscheos*, the scrotum; *kēlē*, a tumor]: scrotal hernia, formed solely by the intestine. ENTEROTOME, n. *ĕn'tĕr-o-tōm* [Gr. *temnō*, I cut]: instrument for opening the intestinal canal through the whole extent. EN'TEROT'OMY, n. *-ōt'ŏ-mĭ* [Gr. *tŏmē*, a cutting]: the act or art of dissecting the intestines.

ENTERI'TIS: inflammation of the bowels. All the coats of the intestine are usually not simultanously or equally involved. The symptoms are: constipation (q.v.), when the serous coat is chiefly involved, diarrhea when the inflammation affects mainly the mucous coat, with colic (q.v.), and sometimes ileus (q.v.). E. is distinguished from these last affections, indeed, only by the presence of inflammatory symptoms—i.e., pain, tenderness, fever, etc., from a very early stage of the disease, and in so decided a form as to require special attention. If E. does not ensue from mechanical obstruction, it may be combated by hot fomentations, with moderate leeching and counter-irritation, and the internal administration of opium. Injections of warm water, or of asafœtida and turpentine (see CLYSTER), should be at the same time given to clear the lower bowel; and all purgatives, except in some cases castor oil, should be avoided. The disease is, however, one of great danger, and should never be treated with domestic remedies, but only under the care of a physician. It is often complicated by peritonitis (q.v.), in fact it *is* peritonitis when the serous coat is implicated.

In the Lower Animals.—Inflammation of the bowels among the heavier breeds of horses, generally results from some error of diet, such as a long fast followed by a large, hastily devoured meal, indigestible or easily fermentable food, or large draughts of water at improper times. When thus produced, it is frequently preceded by stomach staggers or colic, affects chiefly the mucous coat of the large intestines, and often runs its course in eight to twelve hours. With increasing fever and restlessness, the pulse soon rises to 70 or upward, and, unlike what obtains in colic, continues throughout considerably above the natural standard of 40 beats per minute. The pain is great, but the animal, instead of recklessly throwing himself about, as in colic, gets up and lies down cautiously. Respiration is quickened, the bowels are torpid. Cold sweats, stupor, and occasionally delirium, precede death. When connected with, or occurring as a sequel to influenza, laminitis, and other diseases, the small intestines are as much affected as the large, and the peritoneal as well as the mucous coat of the bowels. This form is more usual in the lighter breeds. When the patient is seen early, while the pulse is still clear and dis-

tinct, and not above 60, and the legs and ears warm, bloodletting is useful, as it relieves the overloaded vessels, and prevents that exudation of blood which speedily becomes poured out in the interior of the bowels. This disease should be treated as follows: In a pint of oil, or an infusion of two drachms of aloes in hot water, give a scruple of calomel and an ounce of laudanum, and repeat the calomel and laudanum every hour in gruel until the bowels are opened, or five or six doses are given. Encourage the action of the bowels by using every half hour soap and water clysters, to which add laudanum so long as pain and straining continue. If the animal is nauseated and stupid, with a cold skin, and a weak quick pulse, bleeding and reducing remedies are very injurious; and the only hope lies in following up one dose of the calomel and aloes with small does of laudanum and sweet spirit of nitre, or other stimulants, repeated every 40 minutes. In all stages, woolen cloths wrung out of hot water and applied to the belly encourage the action of the bowels, and relieve the pain.

Enteric in cattle is produced mostly by coarse wet pasture, acrid or poisonous plants, bad water, and overdriving. The symptoms are fever and thirst, a quick but rather weak pulse, restless twitching up of the hind limbs, tenderness of the belly, and torpidity of the bowels. Calves generally die in three or four days, other cattle in a week or nine days. Bleed early, open the bowels with a pint of oil and a drachm of calomel, which may be repeated in eight or ten hours, if no effect is produced. Give every hour fifteen drops of Fleming's tincture of aconite in water, until six or seven doses are given. Allow only sloppy and laxative food, such as treacle, gruel, or a thin bran mash; employ clysters and apply hot cloths to the belly, and use two-ounce doses of laudanum if the pain is great. Enteric in sheep is caused by exposure to storms and cold, over-feeding, eating acrid plants, or by a sudden change of food. In early stages it resembles colic, but is less amenable to treatment. Pain is severe, abdomen tender, pulse quick, urine high-colored, bowels are obstinately constipated, and nose and feet are cold. Purgatives in large doses, together with anodynes, should be administered in a mucilage of slippery elm bark or gum arabic. In very mild cases injections of warm water may be sufficient. After the febrile stage is passed tonics are required. Mucilaginous drinks and warm bran mashes should be given during convalescence.

ENTERODELA, n. *ĕn-tėr-o-dē'la* [Gr. *enteron*, an intestine; *dēlos*, manifest, visible]: name given by Ehrenberg to a section of his polygastric infusoria, in which the alimentary canal, which is conspicuous, has an aperture at each end.

ENTERORRHŒA, n. *ĕn'tĕr-ō-rē'ă* [Gr. *entĕrŏn*, an intestine; *rhĕō*, I flow]: an abnormal increase of the secretions of the mucous glands of the intestines.

ENTEROZOA, n. plu. *ĕn'tĕr-ō-zō'ă* [Gr. *enteron*, an intestine; *zōŏn*, an animal]: a general name for the intestinal parasites which infest the bodies of animals.

ENTERPRISE, n. *ĕn'ter-prīz* [F. *enterprise*, an undertaking—from F. *entre*, between; *prise*, a taking]: anything attempted to be performed; an undertaking; any bold or hazardous undertaking; boldness; energy: V. in *OE.*, to undertake; to essay; to receive. EN'TERPRI'SING, a. bold; resolute; active. EN'TERPRI'SINGLY, ad. *-lĭ*.

EN'TERPRISE, THE: an American 12-gun schooner with a brilliant naval career. Built 1799 to deal with the French privateers in the West Indies, she had an extraordinary cruise in 1800: in a six-months' run she took 8 privateers, some of them much heavier than herself, and aggregating 47 guns, besides recapturing 4 American merchantmen. Sent to the Mediterranean against the Barbary pirates, she captured a 14-gun Tripolitan after a fierce engagement, and later was at the bombardment of Tripoli. But her finest battle was with the English brig Boxer, Capt. Blythe, on 1813, 5 Sep. off the Maine coast, toward Monhegan Island. She had then 16 guns, and was under Lieut. William Burrows; the Boxer had 14. The crews were about 100 each. The fight began at 3.20 P.M., and was ended at 4 by the Boxer striking, literally cut to pieces in hull, masts, rigging, and spars, several of her guns dismounted, boats and quarters shattered; while the Enterprise was almost uninjured, Both commanders were killed. American loss, 2 killed, 10 wounded; British, 4 killed, 17 wounded.

ENTERTAIN, v. *ĕn'tėr-tān'* [F. *entretenir*, to hold in talk, to hold together—from F. *entre*, between; *tenir*, to hold—from L. *tenērĕ*, to hold—*lit.*, to hold in talk]: to treat with hospitality; to amuse or instruct by conversation; to cherish or harbor in the mind; to please or divert. EN'TERTAIN'ING, imp.: ADJ. pleasing; amusing; diverting; N. in *OE.*, entertainment. EN'TERTAINED', pp. *-tānd'*. EN'TERTAIN'ER, n. one who gives the rites of hospitality to a guest; one who amuses or diverts. EN'TERTAIN'MENT, n. hospitable reception; a feast; a repast; amusement; in *OE.*, the state of being in pay, as soldiers or servants; a dramatic performance; pleasure or amusement from conversation. EN'TERTAIN'INGLY, ad. *-lĭ*.—SYN. of 'entertain': to amuse; maintain; support; accept; harbor; cherish;—of 'entertainment': diversion; recreation; sport; pastime; banquet; reception.

ENTHELMINS, n. *ĕn-thĕl'mĭns* [Gr. *entos*, within; *helmins*, a worm]: an intestinal worm. ENTHELMINTHA n. *-mĭnth'a*, the presence of intestinal worms, or their presence in larger numbers than usual.

ENTHOPHYLLOCARPI, n. *ĕn-tho-fĭl-lo-kâr'pī* [Gr. *enthen*, on the one side and the other; *phullon*, a leaf; *karpos*, fruit]: a division of *Bryaceæ* (True Mosses) in which the lateral or terminal theca springs from a duplication of the leaves.

ENTHRALL, v. *ĕn-thrawl′:* same as ENTHRAL, which see. ENTHRAL′MENT, n. a state of slavery; servitude.

ENTHRONE, v. *ĕn-thrōn′* [*en*, in, and *throne:* OF. *enthroner*, to enthrone]: to invest with sovereign authority; to install a bishop. ENTHRO′NING, imp. ENTHRONED′, pp. *-thrōnd′*, seated on a throne; regal. ENTHRO′NIZATION, n. *-nī-zā′shŭn*, or ENTHRONE′MENT, n. the induction or installation of a bishop.

ENTHUSIASM, n. *ĕn-thō′zĭ-ăzm* [Gr. *enthousiăs′mos*, divine transport or inspiration—from *en*, in; *thĕŏs*, a god: F. *enthousiasme*]: elevation of fancy; intense heat of imagination arising from belief in revelation; elevated and noble excitement in pursuit of some good; fanaticism; violent excitement of mind in the pursuit of some object; ardent zeal. ENTHU′SIAST, n. *-ăst*, one filled with mental excitement; one imagining himself possessed of some special revelation; a zealot; one who is ardent and imaginative. ENTHU′SIAS′TIC, a. *-ăs′tĭk*, ardent; zealous; visionary: also ENTHU′SIAS′TICAL, a. *-ăs′tĭ-kăl*. ENTHU′SIAS′TICALLY, ad. *-lĭ*.—SYN. of 'enthusiast': fanatic; devotee; visionary; bigot.

ENTHYMEME, n. *ĕn′thĭ-mēm* [Gr. *enthumēmă*, a thought, a syllogism—from *en; thumos*, the soul, mind: F. *enthymème*]: in *logic*, an argument consisting of two propositions, an antecedent and a consequent; a syllogism where one premise is suppressed.

ENTICE, v. *ĕn-tīs′* [OF. *entiser*, and *enticer:* Bret. *atiza*, to instigate, to incite: Dut. *hissen;* Ger. *hetzen*, to set on dogs—the origin being the hissing sound by which dogs are incited to attack other animals]: to attract by exciting hope or desire; to allure; to tempt; to decoy; to lead astray. ENTI′CING, imp. *-sĭng:* ADJ. alluring. ENTI′CINGLY, ad. *-lĭ*. ENTICED′, pp. *-tīst′*. ENTI′CER, n. *-sẽr*, one who. ENTICE′MENT, n. *-tīs′mĕnt*, that which allures; that which seduces or incites to evil.—SYN. of 'entice': to seduce; incite; coax; inveigle; persuade; attract; induce.

ENTIRE, a. *ĕn-tīr′* [F. *entier;* It. *intero*, whole, complete—from L. *intēgrum*, whole, untouched]: undivided; unbroken; whole; complete in all its parts; without defect; uncastrated, as an entire horse; sincere; honest; wholly devoted; unmixed; in *OE.*, internal; interior. ENTIRE′LY, ad. *-lĭ*, in the whole; completely; in *OE.*, internally; in the heart. ENTIRE′NESS, n. *-nĕs*, wholeness; completeness. ENTIRE′TY, n. *-tĭ*, the whole; completeness: the preceding words sometimes spelled with *i* in *OE.*—SYN. of 'entire': complete; total; integral; perfect; radical; undivided; full; undiminished; unalloyed; unmingled; pure; unmutilated.

ENTITLE, v. *ĕn-tī′tl* [F. *entituler*—from L. *intĭtŭlārĕ*—from L. *en; titŭlŭs*, a title]: to name or designate; to give or prefix a name to; to qualify; to give a right to demand; to give a claim to. ENTI′TLING, imp. *-tī′tlĭng*, designating; giving a claim to. ENTI′TLED, pp. *-tī′tld*, named; having a claim to.—SYN. of 'entitle': to designate; name; style; characterize: denominate.

ENTITY, n. *ĕn'tĭ-tĭ* [F. *entité*—from mid. L. *entĭtātem*, entity—from L. *entem*, being]: being; existence; a real being. NONEN'TITY, n. [see the word]: a thing having no real existence.

ENTOBLAST, n. *ĕn'to-blăst* [Gr. *entos*, within; *blastos*, a sprout, shoot, or sucker]: the nucleolus of a cell.

ENTODERM: another name for ENTOBLAST.

ENTOMB, v. *ĕn-tôm'* [*en*, in, and *tomb*: OF. *entomber*, to entomb—from mid. L. *intumŭlārĕ*]: to hide or conceal completely; to put or place in a tomb. ENTOMB'ING, imp. ENTOMBED', pp. *-tômd'*. ENTOMB'MENT, n. *tôm'mĕnt*, entire seclusion; burial.

ENTOMIC, a. *ĕn-tŏm'ĭk* [Gr. *entŏmă*, insects]: pertaining to insects. ENTOMOID, a. *ĕn'tŏm-oyd* [Gr. *eidos*, resemblance]: resembling an insect. ENTOMOMETER, n. *-to-mŏm'ĕ-tĕr* [Gr. *metron*, a measure]: instrument for measuring the parts of insects.

ENTOMOLINE. see CHITINE.

ENTOMOLOGY, n. *ĕn'tō-mŏl'ŏ-jĭ* [Gr. *entŏmă*, insects; *logos*, discourse: F. *entomologie: entoma*—from Gr. *en; tomē*, a cutting]: that branch of natural science which treats of the history and habits of insects (q.v.). EN'TOMOL'OGIST, n. *-jĭst*, one who studies insects. EN'TOMOLOG'IC, a *lŏj'ĭk*, or EN'TOMOLOG'ICAL. a. *-ĭ-kăl*, pertaining to. EN'TOMOLOG'ICALLY, ad. *-lĭ*. ENTOM'OLITE, n. *-tŏm'ō-līt* [Gr. *lithos*, a stone]: the general term for a fossil insect.—*Entomology* is important both philosophically and practically. The mere collector of insects may be one of the humblest laborers in the great field of natural history, but his labors contribute materials for the more philosophic naturalist who studies the structures of these creatures, and compares them with one another according to the unity and the variety of design which they exhibit. And when we begin to take into account the vast number of different species of insects, their great diversities of structure and of habits, their great complexity of organization, the wonderful transformations which many of them undergo at different stages of their existence, and the equally wonderful but extremely various instincts which many of them display, we find entomology to be a science worthy to engage the noblest mind. But besides all these things, we must remember that insects serve most important purposes in the general economy of nature; and that some of them are directly useful to man, some directly injurious, at least when their numbers are at any time excessively multiplied.

Entomology, with the other branches of natural history, was cultivated by Aristotle and other Greeks. Aristotle is the most ancient author of whose works anything relating to this science now remains. Pliny has little on this subject but what is copied from Aristotle; and it can scarcely be said to have been again studied as a science till the 16th c., when attention began once more to be

directed to it, though it was not till the 17th c. that much progress was made, or that any important works on entomology appeared. Insects then began to be described, not only those of Europe, but also some of the curious and splendid insects of tropical countries; bees and other insects of particular interest received attention; the metamorphoses of insects began to be studied, and their anatomy to be investigated. The names of Goedart, Malpighi, Swammerdam, Leuwenhoek, and Ray, deserve to be particularly mentioned; but the infant state of the science may be illustrated by the fact, that about the end of the 17th c., Ray estimated the whole number of insects in the world at 10,000 species, a number smaller than is now known to exist in Britain alone. In the 18th c., the name of Linnæus occupies as high a place in the history of entomology as in that of kindred branches of science. The progress of the science was much promoted by his arrangement and exhibition of the discoveries of previous and contemporary naturalists; and by his system of classification, founded on characters taken from the wings, or their absence, a system professedly artificial, yet so harmonizing with the most natural distribution into groups, that some of its orders were indicated by Aristotle, and that it has retained and seems likely to retain its place, modified, indeed, but not essentially changed. De Geer and Fabricius are perhaps, after Linnæus, the most worthy to be named of the great entomologists of the 18th c. At the close of the 18th and beginning of the 19th c., the name of Latreille is pre-eminently conspicuous; and in 1815, a new impulse began to be given to the study of entomology in Britain by the publication of the admirable *Introduction to Entomology* of Messrs. Kirby and Spence, a work combining in a remarkable degree popular and scientific merits. Since the beginning of the 19th c., the number of insects known and described has prodigiously increased; many entomologists have with great advantage applied themselves particularly to the study of particular orders of insects; and many valuable monographs have appeared. Entomological literature has now become very extensive. The progress of the science has owed not a little to entomological societies of which the Entomological Soc. of London may be particularly mentioned. Without an attempt to enumerate the distinguished entomologists of the 19th c., perhaps the names of Leach, Macleay, Curtis, Stephens, Westwood, Smith, Walker, Stainton, Swainson, Newport, Darwin, and Lubbock, deserve notice in Britain: Meigen, Jurine, Gyllenhal, Gravenhorst, Hubner, Dufour, Boisduval, Erichsen, Burmeister, Gerstäcker, on the Continent; in general entomology, in America, Say, Harris, Walsh, Fitch, Packard, Riley; in the study of special orders, Scudder, J. L. Leconte, Cresson, Uhler, Hagen, Grote, Lintner, Emerton, McCook, Edwards, etc.

ENTOMOLOGY, ECONOMIC. Insecticides were first

generally employed about the middle of the nineteenth century. The migration of the Colorado potato beetle from its native home in the Rocky Mountain region to the potato fields of the East was the indirect means of the employment of arsenical preparations as a means of destroying insects. Paris green appears to have first been applied to this potato pest in Michigan in 1867. In 1878 Prof. A. J. Cook, when using Paris green as a remedy for canker-worms, found that the trees treated with it were free from codling moth. To Prof. Cook also is probably due the first use of kerosene mixed with soap, although the kerosene emulsion, which is now a standard remedy for all sucking insects, was the joint product of Messrs. Barnard, Hubbard and Riley, and was first used in 1877. Paris green has been replaced by arsenate of lead, because the latter, while poisoning the insects, does not scald or otherwise injure the plants. The ravages of the cottony cushion scale (*Icerya purchasi*) of the orange orchards of California led to experiments conducted by Mr. D. W. Coquillett, of the United States Department of Agriculture, in 1886, to the finding of hydrocyanic-acid gas as the best medium for extirpation of scale insects, and to its general use in fumigation for all insects which can be treated with it. Bisulphide of carbon was first employed by M. Doyere, a Frenchman, as early as 1856, as a remedy for weevils in stored grain, which is still its principal use. It supplements the use of hydrocyanic acid gas in that the former is used for the fumigation of plants above ground, while the latter destroys insects affecting the root-system. Both gases are used for the treatment of indoor insects in granaries and mills, and in dwellings and ware-houses. Although these are the main insecticides, there are others, nearly all of which owe their discovery and perfection to economic entomologists in America. They include pyrethrum, better known as Buhach, Persian, and Dalmatian insect-powders, the extensive use of which has resulted in the establishment of a considerable industry in the growing of the principal plants which produce these powders (*Pyrethrum cinerariæfolium* and *Pyrethrum roseum*); and whale-oil and fish-oil soaps, originally used against the hop-plant louse in 1886, and later against scale-insects. In more recent years what is now termed the 'lime, sulphur, and salt wash' has been found a very valuable remedy against scale-insects.

Some of our principal pests, with which we cannot cope successfully by means of insecticides or by mechanical methods, may be controlled by the judicious use of ordinary methods of tillage. By planting different immune varieties of wheat the ravages of the Hessian fly are reduced to a minimum.

The prompt destruction of crop remnants, and the pulling up and burning over of weeds and other rubbish, is a preventive applicable to all crops. Another measure is the use of 'trap crops.' Thus part of an old crop may

be left to attract insects which usually remain in the field after the crop is made; similar or more attractive plants may be grown for the protection of the main crop; or of early varieties of the same plants, as lures for the insects until the main crop can obtain a good start. Trap crops are of considerable value in the treatment of several of the worst enemies of cucumbers, melons, squashes, and similar vines. The stimulation of a plant by means of fertilizers, and the maintenance of healthy, vigorous growth by cultivation, the suppression of diseases, and the prevention of injury by insect pests other than those which it is specially designed to circumvent, are helpful aids. Crop rotation, or the planting of alternate crops which are not injured by those insects which ravage the staples assists in the warfare; as also do fall and spring plowing, which, in proper combination, result in the destruction of nearly all forms of the many insects which pass one or more stages in the earth in hibernation. The use of water by irrigation or submersion, if practised at the right time, will result in the temporary extirpation of nearly all insects in the fields thus treated, particularly in cranberry bogs. The reclamation by drainage of land subject to more or less complete submersion, such as swampy tracts, river bottoms, and the like, and the destruction of the weeds and other plants and the insect life which remain by burning over, are of great value in suppressing many pests. If, to the methods above outlined, we add the strict observance of timely harvesting of crops with a view to the prevention of further attack and the destruction of insects which might reproduce the following year; the utilization of natural enemies, such as parasitic and predaceous insects, poultry, and live stock, to destroy the insects in the field after the crop is off; the systematic inspection of the farm for the first appearance of insect attack, and, finally, the co-operation of neighboring farmers, there is comparatively little use for insecticides save in the case of insects such as grasshoppers and the caterpillars of moths and butterflies, which are strong fliers and cannot be successfully controlled by mechanical methods.

Dr. T. W. Harris is credited with having been the first economic entomologist of this country, but in reality the honor is due to W. D. Peck, who began writing on injurious insects late in the 18th century (1795–1819). His writings, however, are few, in comparison to those of Harris, whose labors began in 1831 and whose greatest work appeared in 1841, his classic treatise on *Insects Injurious to Vegetation.* In the year 1853 the New York State legislature appropriated $1,000 for the study of economic entomology, and Dr. Asa Fitch was appointed to perform the work specified. Fitch's work continued until 1871 or 1872, when his 14th and last report was published. Afterward different States, Illinois in 1866–7, and Missouri about a year later, appointed State entomologists, the latter State obtaining the services of Dr.

C. V. Riley, who wrote a series of nine reports which, for originality, scientific accuracy, and practical value, have received recognition the world over.

When Dr. Riley assumed the duties of entomologist of the United States Department of Agriculture, economic entomology received a new impetus, his work and that of his assistants marking a new era in practical entomological work. Upon his death in 1894, he was succeeded by Dr. L. O. Howard, under whose direction the Division of Entomology continues to issue reports, bulletins, and circulars of the highest practical and scientific value.

Prior to 1888 Massachusetts, New York, Illinois, and Missouri, were the only States which maintained officially appointed economic entomologists. During that year the State Agricultural Experiment Stations were organized under the Hatch Act, and several official entomologists were appointed in connection with them. In 1889 was formed an Association of Economic Entomologists which held annual meetings in various cities subsequently and had in 1903 a total membership of 167.

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ENTOMOPHAGOUS, a. *ĕn′tō-mŏf′ă-gŭs* [Gr. *entŏmă*, insects; *phagō*, I devour]: insect-eating—applied to animals which chiefly subsist on insects. EN′TOMOPH′AGA, n. plu. *-mŏf′ă′gă*, the section of the marsupials which chiefly live upon insects. ENTOMOPH′AGAN, n. *-găn*, animal belonging to the entomophaga.

ENTOMOPHILOUS, a. *ĕn′tō-mŏf′ĭ-lŭs* [Gr. *entŏmă*, insects; *phĭlĕō*, I love]: in *bot.*, applied to flowers in which pollination or fertilization is effected by insects.

ENTOMOSTEGIDÆ, n. *ĕn-tō-mo-stĕj′ĭ-dē* [Gr. *entomos*, cut in pieces; *stegē*, a roof; a covering]: family of *Rhizopoda*, consisting of animals with shells, the chambers arranged spirally in a double series.

ENTOMOSTOMATA, n. *ĕn-to-mo-stŏm′a-tâ* [Gr. *entomos*, cut in; *stoma*, the mouth; named from the notched lip]: old division of mollusks, including *Buccinĭdæ*.

ENTOMOSTRACA, n. *ĕn′tō-mŏs′tră-kă* [Gr. *entŏma*, insects; *ostrăkon*, shell]: order of minute crustacea. They

have a developed cephalo-thorax; mandibles and 3 pairs of maxillæ; 5 pairs of thoracic feet, and no abdominal; and are destitute of gills. The sub orders are *Copepoda*, represented by Cyclops (q.v.) and other forms, known as water-fleas; and *Siphonostoma*, parasitic and worm-like. Formerly, entomostraca included several other orders.

ENTOMOTOMIST, n. *ĕn-to-mŏt′o-mĭst* [Gr. *temnō*, I cut]: one who anatomizes insects; one who practices entomotomy. ENTOMOT′OMY, n. *-mĭ*, the dissection of insects, and the science which treats of their anatomy.

ENTONIC, a. *ĕn-tŏn′ĭk* [see ENTASIS]: in *med.*, having great tension or exaggerated action.

ENTOPERIPHERAL, a. *ĕn-tŏ-pĕr-ĭf′ėr-ăl* [Gr. *entos*, within; Eng. *peripheral*]: term introduced by Herbert Spencer to designate sensations, feelings, etc., produced by causes operating within the periphery, circumference, or outer surface of the body, as the sensations of hunger and thirst. It is opposed to epiperipheral.

ENTOPHYTE, n. *ĕn′tō-fīt*, EN′TOPHYTES, *-fītz*, or EN′-TOPHYTA, n. plu. *ĕn-tŏf′ĭ-tă* [Gr. *entos*, within; *phuton*, a plant]: vegetable parasites which exist within living bodies, found in some diseases of the mucous membranes of the mouth and alimentary canal; plants growing within others: ENTOPHYTIC, a. *ĕn′tō-fĭt′ĭk*, developing in the interior of plants and afterward appearing on the surface, as fungi. —*Entophytes* denotes usually those parasitic plants which grow on living animals. It is seldom extended to vegetable parasites which grow on living vegetables, whether on external or internal parts, nor is it restricted to those found in the internal cavities, or within the substance of animal bodies, but includes all which have their seat on living animal tissues. It does not, like the analogous term *Entozoa*, denote any particular class of organized beings; some of the entophytes are *Algæ*, and some *Fungi*, but to these two series they are limited, and all belong to the lower section of these series, some to those lowest sections in which the distinguishing characters of the two series cannot easily be traced, so that they are referred to the one or the other on very slender grounds; those in which a coloring matter is present being reckoned algæ, though it can be observed only in masses of aggregated cells, and not in the cells when viewed separately, and those which even in the mass appear entirely colorless, being considered fungi. Many of the algæ and fungi parasitic on plants are nearly allied to those on animals; thus, ergot and the kind of mildew which has proved so destructive to vines, are referred to the same genus (*Oidium*) to which is referred also the fungus found in the diseased mucous membrane in cases of *aphthæ* or *thrush:* and another genus (*Botrytis*, q.v.) contains the fungus called Muscardine, or Silkworm Rot, so destructive to silkworms, together with the fungus which accompanies or causes the potato disease, and many other species which infest plants. Common mold is even supposed to occur an animal tissues tending to decay, during life, as well as on dead animal and vegetable substances.

Vegetable parasites occur both in man and in the lower animals; not a few are peculiar to fishes, and more are peculiar to insects than to any other class of animals. The fungi which grow on the bodies of insects sometimes attain extraordinary development: *Sphæria sinensis*, which grows on a Chinese caterpillar, and to which medicinal virtues, probably imaginary, are ascribed in China, attains a length greater than that of the caterpillar itself. A similar species (*S. robertsii*) is found on the caterpillar of a New Zealand moth.

The situations in which entophytes occur are very various. Some, like the thrush fungus already noticed, appear in diseased conditions of the mucous membrane; some find their place in the lungs, the ear, or other organs; some on the skin, in the hair follicles, and *in* as well as *on* the hair itself. The 'fur' which appears on the tongue when the stomach is disorded, abounds in the extremely slender unbranching threads of the alga called *Leptothrix buccalis*, which also vegetates luxuriantly in cavities and corners of the teeth not sufficiently visited by the tooth-brush. The lungs of birds, the gills of fishes, the intestines of insects, the wing-covers of beetles, the eggs of mollusks, all have their peculiar vegetable parasites by which they are sometimes infested.

It is often difficult to say whether the presence of entophytes is to be regarded as the consequence or as the cause of disease; sometimes it may be both. Sometimes it appears to be certainly a consequence, as when the *Sarcina* (or *Merismopædia*) *ventriculi* occurs in the contents of the stomach and bowels; sometimes as in the diseases called *Favus*, *Porrigo*, *Tinea*, *Herpes tonsurans*, *Plica polonica*, *Mentagra*, *Pityriasis versicolor*, etc., it seems entitled to be regarded as the cause of the diseased state, and the cure of the disease seems to be accomplished by killing the parasite, often a difficult work.

Whence the germs of entophytes are derived is often doubtful. Their spores are extremely minute; but there are no plants which produce seeds or spores more abundantly than some of them do; the growth of the plants themselves is rapid, and reproduction is very intense and rapid.

ENTOPTERYGOID, n. *ĕn-tō-tĕr′ĭ-goyd* [Gr. *entos*, within; Eng. *pterygoid*]: oblong, thin, scale-like bone attached to the inner border of the co-adapted halves of the palative and true pterygoid in fishes, and increasing the bony roof of the mouth in the direction toward the median line

ENTOPTIC, a. *ĕn-tŏp′tĭk* [Gr. *entos*, within; *eptomai*, to see]: pertaining or relating to visions seen by the eye when the lids are shut.

ENTOSTHOBLAST, n. *ĕn-tŏs′tho-blăst* [Gr. *entosthe*, from within; *blastos*, a sprout, shoot, or sucker]: nucleus of the nucleolus or entoblast.

ENTOURED, a. *ĕn-tôrd′* [F. *entourē*]: in *her.*, term applied to a shield decorated with branches.

ENTOZOON, n. *ĕn'tō-zō'ŏn*, EN'TOZO'A, n. plu. *-ă* [Gr. *entos*, within; *zōŏn*, an animal]: an animal which lives within the bodies of other animals—properly applied to those infesting the intestines. EN'TOZO'IC, a. *-ĭk*, relating to or connected with the ENTOZOA. EN'TOZOOL'OGIST, n. *-zō-ŏl'ŏ-jĭst* [Gr. *logos*, a discourse]: one who investigates the habits and characters of internal parasites.

Entozoa is a term applied to all the animal forms which live either in the natural cavities (for example, the intestinal canal), or in the solid tissues (for example, the liver) of other animals. The number of these parasites is so great (there being at least 20 distinct species of worms found in man, 14 in the dog, 15 in the horse, 11 in the common fowl, etc.), and their occurrence so frequent, especially in some of the lower animals, that we must regard their presence, at all events in many species, rather as the normal condition, than as a morbid state due to accidental causes.

It is worthy of notice, that many of the animals included among the entozoa have a parasitic existence during only a part of their total life, which often, as in the well-known case of perfect insects, presents very varied and distinct phases. Thus, for example, the larvæ of the gadfly (*Œstrus equi*) undergo their entire development in the stomach of the horse, attaching themselves by minute hooks to the gastric mucous membrane; they then detach themselves, pass along the intestines, and in due time are discharged, and undergo their further changes externally; and many similar instances might be quoted. For this reason, and additionally because parasites are now known to belong to various classes of animals, we no longer attempt, like Linnæus and Cuvier, to form a special group of E.; and a reference to the *Vermes intestinæ* in the *Systema Naturæ*, or to the *Entozoaires* in the *Règne Animal*, at once shows that these illustrious naturalists grouped together animals with few or no true natural affinities.

Entozoa belong largely but not exclusively to the class of *Vermes*, or *Worms*. Thus, even fishes may lead a parasitic existence; a fish of the genus *Fierasfer* being often found in the respiratory cavity of the *Holothuria tubulosa*, or *Sea-cucunber*, and small fishes being frequently observed in the cavity of the *Asteria discoïdes*. Among the crustaceans, instances of parasitism are not rare; different species of *Lernæa* being abundant in the branchial (or gill) cavity, and on the surface of numerous fishes, while the *Linguatulæ* infest mammals, reptiles, and fishes, being found in the olfactory of the sinuses, the larynx, the lungs, the peritoneal cavity, etc. The instances in which mollusks are found to live parasitically are few; certain gasteropods, however, inhabit the bodies of echinoderms, holothurias, and comatulas; and among the lamellibranchiates, species of modiolaria and mytilus live in the bodies of ascidians. There are several cases of polyps observed to adopt a parasitic existence; finally, various protozoa are frequently found in the animal fluids; for example, certain species of *Vibrio*, *Cercomonas*, and *Paramecium*, have been found

in the intestinal evacuations in cholera and diarrhœa; *Monads* in the urine in cholera, and certain infusoria and rhizopoda in the blood of the dog, the frog, and many other animals. See HÆMATOZOA.

The more common kinds of entozoa appear to have attracted the notice of the earliest physicians and naturalists whose opinions or works have reached us. Hippocrates speaks of several worms, especially tæniæ and ascarides, infesting the human intestinal canal; and Pythagoras learned in India that the bark of the pomegranate acted almost as a specific in cases of tape-worm. Aristotle noticed the tapeworm both of the dog and of man, and the *Cysticercus cellulosæ* (see CESTOID WORMS, under CESTOID) of the pig; but, utterly unaware that the cysticercus, under favorable conditions, became developed into a tape-worm (see TAPE-WORM), referred the origin of all intestinal worms to spontaneous generation—a doctrine that seems to have been general till the 17th c., when Redi published (1684) a work on Helminthology, in which he distinctly showed that the generation of various entozoa followed the same laws as in higher animals, and that in many instances there were distinct males and females. For the great recent discovery, that the vesicular or bladder-like parasites, such as the different species of cysticercus and cœnurus, are cestoid worms in an early stage of development (alluded to in CESTOID WORMS), see TAPE-WORM.

Another point of general interest in connection with E., is the part of the body in which they are found. While most live in the intestinal canal and other open cavities as (the larynx, bronchial tubes, etc.), others are found in the closed cavities, and in the parenchymatous tissue of the liver and other solid organs. Thus (noting only the E. occuring in man), *Anchylostoma duodenale, Strongylus duodenalis,* two species of *Ascaris, Oxyruris vermicularis, Trichocephalus dispar, Distoma heterophyes,* at least four species of *Tænia* and *Bothriocephalus latus,* have been found in different parts of the intestinal canal; while *Strongylus gigas* inhabits the kidney, another species of *Strongylus* the lungs, a species of *Spiroptera* the bladder, two species of *Filaria* and *Monostoma Lentis* the eye, *Trichina spiralis* the voluntary muscles, two species of *Echinococcus* and *Cysticercus cellulosæ,* various parenchymatous tissues, two species of *Distoma* the gall-bladder; another species the portal vein, and the *Filaria Medinensis,* or *guinea-worm,* the subcutaneous tisue.

Davaine, who may be regarded as one of the very highest authorities on this subject, gives the following synopsis of the entozoa occurring in man and the domestic animals (see his *Traité des Entozoaires,* Paris 1860).

TYPE I. PROTOZOA, including the genera *Bacterium, Vibrio, Monas, Cercomonas, Trichomonas, Paramecium.*

TYPE II. CESTOIDEA, including the families of *Tæniadæ* and *Bothriocephalidæ.* The *Tæniadæ* occur (1) in their undeveloped, cystic, or vesicular form, constituting the genera *Cœnurus* and *Cysticercus;* and (2) in their perfect, ribbon-like shape, constituting the genus *Tænia,* of which about 20 species have been described. The *Bothriocephalidæ*

contain the single genus *Bothriocephalus*, which embraces various species. Their early or vesicular stage has not yet been described.

TYPE III. TREMATODEA, including two well-marked secondary types: (1) The *Polystomidæ*, which lives as epizoa on the skin or gills of aquatic animals, and which do not concern us here; and (2) the *Distomidæ*, including the genera *Monostoma, Distoma, Holostoma, Amphistoma*, with the doubtful genera of *Tetrastoma*, and *Hexathrydium*.

TYPE IV. ACANTHOCEPHALA, with the single genus *Echinorhynchus*.

TYPE V. NEMATOIDEA. Passing over two cases in which these worms have been discovered, apparently in their larval or imperfectly developed state (once by Rainey in the human trachea, and once by Vulpian in the kidney of the dog), Davaine gives the following genera, *Oxyuris, Ascaris, Spiroptera, Trichina, Trichosoma, Trichocephalus, Filaria, Dochmius, Sclerostoma, Strongylus, Anchyloetoma, Dactylius*.

TYPE VI. ACANTHOTHECA, including the genus *Pentastoma*.

Alarming as the above list may seem, comparatively few of the worms contained in it do in reality give rise to dangerous or severe symptoms. It seems to be a condition of parasitism, that the animal upon which the parasite lives must not be destroyed by it; and it has been suggested by one of our highest authorities on this subject, Van Beneden, that in many cases the parasite does not so much attack the organism in which it exists, as its superabundant products. Dujardin and other helminthologists have described cases in which worms were developed by thousands in persons apparently in good health. For the symptoms occasioned by Ascarides, Tæniœ, etc., see ASCARIS: TAPE-WORM: etc.

The multiplication of worms is most rapid in debilitated persons, especially children living in cold and damp situations; and impure water, unripe fruits, and raw or imperfectly cooked meat, have considerable influence on the development of these animals. For description of the medicines used for their destruction, see VERMIFUGES: for the structure and habits of the most important E., see ASCARIS: BOTHRIOCEPHALUS: CESTOID WORMS: GUINEA-WORM: MONOSTOMA: NEMATOIDEA: STRONGYLUS: TAPE-WORM: THREAD-WORMS: TREMATODA: TRICHINA SPIRALIS: TRICHOCEPHALUS.

ENTR'ACT, *ânq-trăkt*, in Music: instrumental piece composed in the form of a little symphony or overture, to be performed between the acts of a play.

ENTRAILS, n. plu. *ĕn'trālz* [F. *entrailles*, bowels—from mid. L. *intrālĭă* for *intrānĕă*, the bowels—from L. *inter*, within: Gr. *entĕra*, plu. of *entĕron*, a piece of the guts]: the bowels; internal parts of animals; internal parts: sing. ENTRAIL.

ENTRANCE, n. *ĕn'trăns* [L. *intrans*, entering in (see

ENTER)]: act of entering; a door, gateway, or passage; beginning; the act of taking possession and power of.

ENTRANCE, v. *ĕn-trăns'* [*en*, in, and *trance*]: to put in a trance; to make insensible to present objects; to ravish with delight or wonder. ENTRAN'CING, imp.: ADJ. enrapturing; ravishing. ENTRANCED', pp. *-trănst'*, enraptured; carried away with delight. ENTRANCE'MENT, n. a state of ecstasy.

ENTRANT, n. *ĕn'trănt* [see ENTER]: one who enters, or has entered, an applicant for admission.

ENTRAP, v. *ĕn-trăp'* [*en*, and *trap*]: to insnare; to inveigle; to catch as in a trap; to entangle. ENTRAP'PING, imp. ENTRAPPED', pp. *-trăpt'*.—SYN. of 'entrap': to decoy; implicate; catch; involve.

ENTREAT, v. *ĕn-trēt'* [F. *en*, in: OF. *traicter* and *traiter*, to meddle with; to discourse—from L. *tractārĕ*, to handle]: to solicit pressingly; to ask earnestly; to beseech; to importune; to deal with; to use; in *OE.*, to amuse; to entertain; to petition for. ENTREAT'ING, imp. ENTREAT'ED, pp. ENTREAT'INGLY, ad. *-lĭ*. ENTREAT'Y, n. *-ĭ*, urgent prayer; earnest petition; pressing solicitation.—SYN. of 'entreat': to ask; beg; implore; crave; solicit; supplicate; petition; persuade;—of 'entreaty': importunity; supplication; suit; request; solicitation.

ENTRE DEUX, ad. n. *âng'tr dŭ* [F. *entre*, between; *deux*, two]: so so; indifferently; crochet-insertion, a kind of ornamental work suitable for the dresses of children. ENTRE NOUS, *âng'tr nô* [F. *nous*, us]: between you and me; in confidence.

ENTREE, n. *âng'trā* [F. *entrée*—from *entrer*, to enter]: access; entry; course of dishes at table. ENTRÉES, n. plu. *âng'trāz*, side dishes; not the principal dishes; shortened form of *entremets*. EN'TREMETS, n. *-tr-mā* [F. a dish between—from *mets*, a dish]: side dishes; dishes containing dainties not the principal ones: it has become customary to apply the name *entremets* to the lighter of these dishes. EN'TREPÔT, n. *tr-pō* [F.—from L. *interpŏsĭtum*, to place between]: a warehouse in which goods may be stored; a storehouse. ENTRESOL, n. *âng'tr-sŏl* [F. *entre*, and *sol*, the ground plot or floor]: in *arch.*, a low story between two main stories of a building (usually between the ground floor and the first story), or between two portions of one story, when certain rooms are of greater height than the others upon the same floor. The rooms in the entresol are called *Entresols* or *Mezzanines*.

ENTRE RIOS, *ĕn'trā rē'ōs* (Spanish for *Between Rivers*): one of the states of the Argentine Confederation; named from its situation between the Paraná and the Uruguay; 40,000 to 45,000 sq. m. The country is almost entirely pastoral—its principal production being hides, horns, tallow, and jerked beef. The soil is not well fitted for cultivation, for, besides being rather swampy throughout, it is subject, in the south, to annual floods. The cap. is Paraná (pop. 15,000). Pop. of E. (1889) 300,000; (1900) 343,684.

ENTROCHITES, n. plu. *ĕn'trō-kīts* [Gr. *en*, in or on; *trochos*, a wheel]: a name given to the wheel-like joints of the encrinite; also called En'trochi, n. plu. *-kĭ*, and Entrochitæ, n. plu. *ĕn'trō-kī'tē*.

ENTROPIUM, n. *ĕn-trō'pĭ-ŭm*, or Entropion [Gr. *en*, in; *tropē*, a turning]: in *med.*, the inversion or turning in of the eyelashes, or even of the eyelid, consequent either on loss of substance, or on inflammatory swelling of the lid. If confined to one or two eyelashes, they should be plucked out by the roots, and the bulbs should be cauterized; but the radical cure of severe E. requires careful adaptation of the surgeon's art to the particular case, and should not be attempted by unskilled hands. Entropy, n. *ĕn'trŏ-pĭ*, the available energy of a system, or that which can be converted into mechanical work.

ENTROPY, *ĕn'trŏ-pĭ:* term denoting the available energy of a system, originated with Clausius, great mathematical physicist. He applied it to a mathematical expression, but it is now used in a more general though practically identical sense. By the doctrine of the conservation of energy (see Force), the total energy of the universe is constant. But the power of *doing work* within the limits of the universe is not constant. This power depends on differences in energy possessed by different masses. A steam-engine does work by converting into motion against resistance a certain portion of the heat energy produced by the burning coal. The water in the boiler being of lower temperature, or at a lower pitch of energy, than the products of combustion, flames, etc., of the coal, can absorb energy from those, and rise to a higher pitch. Then in descending nearly to its former pitch it does work. Hence for work to be done energy must leave some mass in order to develop other energy elsewhere, the latter being the effect of work done. But if all matter possessed exactly the same intensity or quality of energy, there could be no interchange. Broadly, the available energy or entropy of the universe is due to the existence of, or possibility of developing, differences of temperature. When all the coal becomes exhausted one great source of entropy will disappear. As all other causes of difference of energy are disappearing as well as the fuel supply, the entropy or available energy of the universe tends toward zero. When it will have reached that point, all objects will have the same temperature and all possible chemical reactions will have been accomplished. If the natural order remains undisturbed, such a condition might be reached many thousands of years from the present time. During many centuries to come, the entropy will be practically undiminished.

ENTRUST: same as Intrust, which see.

ENTRY, n. *ĕn'trĭ* [F. *entrée*, act of coming in (see Enter)]: the passage by which persons enter a house or building; ingress; the exhibition of a ship's papers to the custom-house authorities in order to obtain permission to land the goods; the actual taking possession of lands or

tenements; the act of recording in a book. SINGLE ENTRY, in *book-keeping*, the posting or entry of the items only once —under the buyer's name. DOUBLE ENTRY, the posting or entry of every item twice, on the Dr. side of one account and on the Cr. side of another. RIGHT OF ENTRY, in *law*, right of one who has been wrongfully dispossessed or ousted of land and tenements by Abatement, Intrusion (see these titles), or Disseizin (see Disseize). A right of entry (formerly lost by suffering a descent cast, i.e., where the tenant tortiously in possession is permitted to continue unmolested till his death, and is succeeded by his heir) is now lost in some places by not asserting it for 20 years. ENTRY OF AN HEIR, in the *feudal law of Scotland*, the recognition of the heir of a vassal by the superior or dominus: see CONVEYANCING.

ENTUNE, v. *ĕn-tūn′* [F. *entouner*: Sp. *entonar;* It. *intonare*]: to tune; to sing; to chant.

ENTWINE, v. *ĕn-twīn′* [*en, twine*]: to twist round. ENTWI′NING, imp. ENTWINED′, pp. *-twīnd′*. ENTWINE′, MENT, n. a twining or twisting round. ENTWIST′, v. *-twĭst′*. to twist or wreathe together.

ENUCLEATE, v. *ĕ-nū′klĕ-āt* [L. *enuclĕātus*, cleared from the husk, pure—from *e*, out of; *nuclĕŭs*, a nut]: to clear; to disentangle; to solve. ENU′CLEATING, imp. *-ā-tĭng*. ENU′CLEATED, pp. *-ā-tĕd*.

ENUMERATE, v. *ĕ-nū′mĕ-rāt* [L. *enumĕrātus*, reckoned up, enumerated—from *e*, out of; *numĕrō*, I number: It. *enumerare:* F. *énumérer*]: to reckon up or tell the number of singly; to count or mention several things one by one. ENU′MERATING, imp. ENU′MERATED, pp. ENU′MERA′TION, n. *-ā′shŭn* [F.—L.]: counting up a number of things by naming each particular one. ENU′MERATIVE, a. *-tĭv*, counting singly. ENU′MERA′TOR, n. *-tėr*, one who.

ENUNCIATE, v. *ĕ-nŭn′sĭ-āt* or *-shĭ-āt* [L. *enuncĭātus*, divulged, disclosed—from *e*, out of; *nuncĭō*, I tell: It. *enunciare:* F. *énoncer*]: to declare; to utter; to proclaim. ENUN′CIATING, imp. ENUN′CIATED, pp. ENUN′CIA′TION, a. *-ā′shŭn*, the act or manner of uttering; manner of pronunciation; declaration; in *geom.*, the words in which a proposition is stated. ENUN′CIATIVE, a. *-tĭv*, expressive; declarative. ENUN′CIA′TIVELY, ad. *-lĭ*. ENUN′CIA′TOR, n. *-ā′tėr*, one who enunciates or declares. ENUN′CIA′TORY, a. *-ā′tėr-ĭ*, containing utterance or sound.

ENURE, v. *ĕn-ūr* [see INURE]: to habituate; in *law*, to come into use or power.

ENURESIS, n. *ĕn′ū-rē′sĭs* [Gr. *enourĕō*, I make water—from *en*, in; *ouron*, urine]: incontinence or involuntary escape of the urine.

ENURNY, a. *ĕn-ėr′nĭ* [etym. doubtful]: in *her.*, term applied to a border charged with eight animals of any kind.

ENVELOP, v. *ĕn-vĕl′ŏp* [OF. *envoluper;* F. *envelopper*, to wrap round, to fold up: It. *inviluppare*]: to cover by

folding; to inclose by wrapping; to surround; to hide. ENVEL'OPING, imp. ENVEL'OPED, pp. *-ŏpt.* ENVEL'OPMENT, n. a covering on all sides. ENVELOPE, n. *ĕn'-vĕl-ōp*, an inclosing cover; a wrapper; a kind of flat paper bag or case for sending letters in; any investing integument.—Until the introduction of cheap and pre-paid postage, envelops for written letters were little used; it was customary to secure, by wafer or sealing-wax, the folded sheet of paper on which the letter was written. Envelops have now come into universal use—both those stamped and sold by government, and those unstamped made by private manufacturers. Envelops are made by two methods, involving different amounts of machine-power. The paper is first cut into quadrangular pieces rather longer than wide, by a cutting blade brought to bear upon a pile of sheets at once; and then cutting-dies reduce these pieces to the proper shape, generally lozenge or diamond form, but sometimes with curvilinear edges. For some kinds, it is found to economize both time and paper to stamp the pieces out at once from the rough sheets. The subsequent folding and gumming are performed sometimes by hand, sometimes by machine. In the hand-method, women and girls fold with almost incredible quickness, having very simple guidepieces to aid them in giving the proper oblong quadrangular shape to the fold. The gum is applied with a small brush, either all along the overlapping edges, or in spots here and there, according to the quality of the envelope.

The envelope-machines are beautiful examples of automatic mechanism. In one well-known kind, a cutting-machine severs the blanks or papers; and dies are employed to stamp the device on the spot where the seal would otherwise lie. The blanks are then 'fed' into the folding-machine, where they pass through a curious series of processes. Each blank is carried down into a box, where a plunger makes four creases in it; two short levers fold down two of the flaps thus made; a gumming apparatus comes up, and applies a line of wet gum to each flap-edge; two small levers then fold down the other two flaps (but fastening only one of them); finally, the envelope is shifted aside to a pile, and makes way for another. All these processes are gone through in *one second*, enabling the machine to make 60 envelopes per minute. Where twelve of these machines are working at once, it will be seen that a million envelopes are put out of hand in a very short time.

ENVELOPE, in Geometry: a curve which is constantly touched by a moving curve or line. Thus a straight line moving in a plane so that its perpendicular distance from a fixed point is constant envelopes a circle. If a large number of positions of the line are actually drawn on paper, the circle will be seen lying within them. Another envelope may be found by letting the ends of a ruler move on two perpendicular lines. A set of circles having their centres on a given line and their radii pro-

portional to the distances of their centres from a fixed point in the line touches a pair of straight lines. The normals of a given curve have for their envelope the evolute (q.v.) of the curve. Rays of light reflected from a curved surface, as a piece of tin bent into a cylinder, envelope a curve conspicuous for its brightness and called a *caustic* (q.v.). Other examples of envelopes occur wherever a curve moves according to any definite law. The treatment of the subject requires the Differential Calculus. Envelopes occur in the theory of differential equations, as 'singular solutions.'

ENVENOM, v. *ĕn-vĕn′ŏm* [*en*, and *venom;* OF. *envenimer*, to envenom]: to taint or impregnate with poison or with malice, etc.; to enrage; to make odious. EN-VEN′OMING, imp. ENVEN′OMED, pp. *-ŏmd*, tainted with poison.

ENVIRON, v. *ĕn-vī′rŏn* [F. *environ*, about, around; *environner*, to environ—from *en*, in; *virer*, to veer, to turn round]: to surround or encompass; to encircle or hem in. ENVI′RONING, imp. ENVI′RONED, pp. *-rŏnd*. ENVI′RON-MENT, n. act of surrounding; that which surrounds. ENVIRONS, n. plu. *ĕn′vĭ-rŏnz* or *ĕn-vī′rŏnz*, the parts lying near to or adjacent; the suburbs of a town or city.

ENVOY, n. *ĕn′voy* [F. *envoyer*, to send; *envoy*, a message—from *en*, in; L. *vĭă*, a way]: diplomatic minister of the second order at a court, in dignity below an ambassador; a messenger sent by a state or government to negotiate a treaty with a foreign government; one sent on a special mission. EN′VOYSHIP, n. the office of an envoy.—Envoys ordinary and extraordinary, ministers plenipotentiary, the internuncios of the pope, and all other inferior diplomatic ministers, differ from ambassadors in this, that though they received their credentials, like ambassadors, immediately from their sovereign or personal head of their govt., they represent not his personal dignity, but only his affairs of government. They stand to him as an ordinary agent to his principal, and their acts or promises are his in a business sense, though not in a personal sense. It is said that this class of diplomatists was introduced by Louis XI. of France, toward the end of the 15th c. The envoy is superior in rank to the chargé d' affaires whose credentials proceed from the ministers of the state from which he is sent, and are addressed to the ministers of the state to which he is sent; or are a mere delegation from an ambassador or envoy to conduct the affairs of the mission in his absence. Consuls (q.v.) are not generally reckoned among diplomatic ministers, though, where they have diplomatic duties to perform independently of an ambassador or envoy, they are accredited, and treated as ministers. According to the division of diplomatic agents into four classes, which was made by the great powers at the congress of Vienna, 1815—viz. 1. Ambassadors, legates, and nuncios; 2. Envoys, ministers, and other agents accredited to sovereigns; and 3. Chargés

d'affaires, accredited by and to the departments of Foreign Affairs—an envoy would be of the second, and a chargé d'affaires of the third rank. But the practice of some countries has interjected between the ambassador and the envoy a second class, called envoys extraordinary and ministers plenipotentiary, which, of course, throws the ordinary envoy into the third, and the chargé d'affaires into the fourth class. See CHARGÉ D'AFFAIRES: AMBASSADOR: EMBASSY: CONSUL: DIPLOMACY: MINISTER (in Diplomacy).

ENVY, *ĕn'vĭ* [F. *ĕnvier*, to grudge; *envie*, envy—from L. *invĭdĭă*, envy, grudge—from *in*, in; *vĭdĕō*, I look]: to feel uneasy or mortified at another's superiority; to dislike and be discontented on account of the superior excellence or success of another; to look upon with malice: N. hatred or ill-will excited by the superior success or excellence of another; malice; an object of pain and mortification to others from superior success. EN'VYING, imp.: N. ill-will or mortification on account of some supposed superiority in others. EN'VIED, pp. *-vĭd*. EN'VIER, n. *-ẏr*, one who. EN'VIABLE, a. *-ă-bl*, capable of exciting desire to possess; desirable. EN'VIABLY, ad. *-blĭ*. EN'VIOUS, a. *-vĭ-ŭs*, feeling uneasiness at the superiority or happiness of another. EN'VIOUSLY, ad. *-lĭ*. EN'VIOUSNESS, n. the quality or state of being envious.—SYN. of 'envious': invidious; jealous; suspicious; covetous; grudging.

ENZOOTIC, a. *ĕn'zō-ŏt'ĭk* [Gr. *en*, in; *zōŏn*, an animal]: applied to diseases among the lower animals peculiar to a district.

ENZYMES: an enzyme is a ferment produced by the living cell, either animal or vegetable. In chemical composition it is a proteid. Its action when brought into relation with certain organic compounds is to split them up into simpler combinations, without itself undergoing any change or uniting with the bodies acted upon. How it acts is not definitely determined; some think that its effects are purely catalytic, comparable to that of certain chemical bodies in the presence of more complex compounds; others regard it as a process of hydration. An enzyme acts only when in solution and a very minute quantity may cause the breaking up of large masses of the material acted upon. Enzymes may be classified according to Hahn, into I. Hydrolysing enzymes: 1. Enzymes which split up carbohydrates, (*a*) Diastatic enzymes, (*b*) Inverting enzymes, (*c*) Enzymes which split up glucocides; 2. Enzymes which effect the solution of albumin. II. Enzymes which effect the coagulation of albumin. III. Enzymes which split up fats. IV. Enzymes which convert urea into ammonium carbonate. V. Enzymes which split up monosaccharids (glucose or grape sugar). VI. Oxidizing and reducing enzymes. Familiar enzymes are those elaborated by the organs of digestion, such as ptyalin, a diastatic enzyme of the saliva, converting starch into sugar; pepsin from the stomach, the action of which causes albumin to dissolve: trypsin

from the pancreas, having a similar action, converting proteids into albumoses and peptones; anylopsin, from the pancreas, a diastatic ferment like that of the saliva, converting starch into maltose and dextrin; and steapsin or lipase, also from the pancreas, which splits up fats into glycerin and fatty acids.

EOCENE, a. *ē′ō-sēn* [Gr. *ĕōs*, daybreak, the dawn; *kainos*, recent, or new]: in *geol.*, the Lower Tertiary strata, so called because of the very small percentage (3½ per cent.) of existing mollusca contained in them, indicating the dawn of the present condition of creation. The term was introduced by Lyell. The gradual approximation of the living inhabitants of the globe to the present forms is the chief characteristic of the Eocene and newer deposits. The Eocene beds rest on the chalk. Like the other Tertiary strata, these deposits occupy small and detached areas when compared with the older measures. It is not difficult to determine the relative position of Primary or Secondary strata, because of the great extent of particular beds, being frequently continuous over extensive districts. But Tertiary deposits are more isolated, and occur in smaller and more detached patches; hence it is difficult to determine the contemporaneity of the sections of the various periods. Their relations must be determined from the petrological structure of the beds, which is very inconstant; or from the more satisfactory evidence derived from their fossiliferous contents.

In the following table are given the generally received divisions of this period, with the maximum thickness (in English ft.) of the English strata, and the French and Belgian equivalent beds:

Upper Eocene	1. Hampstead series,	175	Calcaire lacustre superieur, and Gres de Fontainebleau. —Rupelien.
	2. Bembridge series,	115	Gypseous series of Montmartre, Calcaire lacustre moyenne, and Calcaire siliceux.— Tongrien.
Middle Eocene	3. Osborne series,	70	Gres des Beauchamp.
	4. Headon series,	182	
	5. Bagshot series,	1,270	Sables moyennes, Calcaire grossier, and Lits coquilieres. — Laeckenien and Bruxellien.
Lower Eocene	6. London clay series,	480	Wanting in France.—Ypresien.
	7. Plastic clay series,	160	Argile plastique et lignite.— Landenien superieur.
	8. Thanet sand series,	90	Wanting in France. —Landenien inferieur.
	Total Thickness,	2,542 feet.	

A differing and closer classification of the English beds is given below:

	Hampshire Beds	London Beds
Upper Eocene	Headon Hill or Barton sands, Barton clay,	Upper Bagshot sands.
Middle Eocene	Bracklesham beds and Leaf beds of Bourne-Mouth and Alum Bay.	Middle beds—Part of lower Bagshot sands.

	Hampshire Beds	London Beds
Lower Eocene	London clay (Bogner bed) Woolwich & Reading beds or "Plastic clays,"	Part of lower Bagshot London clay. [sands. Blackheath & Oldham beds. Woolwich & Reading beds. Thanet sand—pale yellow sands.

In the United States the Lower, Middle, and Upper E. formations are known as the Claiborne, Jackson, and Vicksburg epochs, and the beds contain numerous marine mollusk fossils and some very large vertebrates. The beds extend from N. J. along a great portion of the s.e. coast, along the Gulf of Mexico, and up the Mississippi river; and the best developed formations are found in Md., Va., N. C., S. C., Miss., and Ala., though the beds in Vt. exhibit leaves and fruits, and those in Wyo. the group of mammals called by Prof. Marsh *Dinocerata*. The Lower E. beds near Claiborne, Ala., have a total thickness of 125 ft.; the Middle E. at Jackson, Miss., contain marine shells and remains of mammoth whales, and stretch across the state like a belt, narrow but abt. 80 ft. thick; and the Upper E. have a total thickness at Vicksburg, Miss., of 112 ft., and extend into Ala., Fla., and S. C., exhibiting both limestone and gray marl. The E. formation is entirely lacking on the Pacific coast of the U. S. See Paleontology.

EOGOIC ERA: see Paleontology.

EOHIPPUS, n. *ē-ō-hĭp′pŭs* [Gr. *ēōs*, the dawn; *hippos*, a horse]: in *paleon.*, genus of *Equidæ*, oldest known member of the horse family. The animals were of small size, had on the fore feet four toes with a rudimentary thumb, and on the hind ones three toes, all the digits terminating in hoofs. It was found by Marsh in the Lower Eocene of New Mexico.

EOHYUS, n. *ĕ-ō-hī′ŭs* [Gr. *ēōs*, the dawn; *huos*, a pig, a swine]: in *paleon.*, oldest known of the *Suidæ* (Pigs); from the Lower Eocene of N. America.

EOLIAN, or Æolian, a. *ē-ō′lĭ-ăn* [*Æŏlŭs*, the god of the winds: *Æolis*, in Asia Minor]: pertaining to Æolis, in Asia Minor; pertaining to Æolus, the fabled deity of the winds; in *geol.*, applied to wind-formed masses, as sand-hills. Æol′ic, a. *-ŏl′ĭk*, pertaining to Æolia, or the Gr. dialect of Æolia. Eolis: see Æolis. Eolian harp, a musical stringed instrument on which the wind acts to produce the notes.

EO′LIAN HARP: see Æolian Harp.

EOLIPILE, n. *ē-ŏl′ĭ-pīl* [*Æŏlŭs*, the god of the winds, and L. *pĭlă*, a ball]: a ball or sphere in which water is heated, and which turns round as the steam escapes through a bent pipe; Hero's engine.

EOLOPHON, or Æolophon, n. *ē-ŏl′o-fŏn* [Gr. *aiolos*, moving with the wind, with changeful notes; *phōnē*, sound]: musical instrument, the seraphine, the predecessor of the melodeon and of the parlor organ.

EON, n. *ē′ŏn:* see *Æon.*

EON DE BEAUMONT, *ā-ōng′ dėh bō-mōng′*, Charles Geneviéve Louis Auguste André Timothée d' (known as the *Chevalier d'Eon*): 1728–1810, May 21; b. Tonnerre, in Burgundy. He studied law, became an advocate, and attracted the notice of the Prince of Conti by some political writings, and was introduced 1755 by the prince to Louis XV., who employed him in diplomatic missions to Russia and Austria. After serving a short time in the army, he was sent to London 1761 as sec. of embassy, and shortly after was made minister-plenipotentiary. Becoming the victim of a court cabal, however, which deprived him of his office, he took his revenge by publishing his secret correspondence with the French court, which contained libels on various persons. For one of these, he was prosecuted in London; and to avoid judgment fled to the continent. He, however, returned to England, but, on the death of Louis XV., the French ministry deemed it prudent to recall him, as they were afraid he might betray their secrets to the English government, which made him brilliant offers. The pretext laid hold of for this purpose, was the scandal excited in London by his having assumed the garb of a woman, which he had done at the request of Louis, the better, it may be presumed, to hide his designs as a 'secret agent.' On his return to France, however, Eon was very favorably received; and Louis XVI. even ordered him to make use of the feminine garb in future. In 1783, he again went to London, not, however, in any visible official capacity; and, though dressed as a woman, gave lessons in fencing, of which art he was a complete master. On the outbreak of the French Revolution he hastened home, and offered his services to the nation; but as nothing came of his offer, he finally returned to London, where he sank into the greatest misery and died. His writings appeared at Amsterdam 1775, under the title of *Loisirs du Chevalier d'Eon.* The *Mémoires* which bear his name are not genuine.

EOPHONE, *ē′ō-fōn:* a funnel-shaped instrument, varying in size, for converging to the ear sounds from a distance and for locating their source. The device being directed toward the probable source, the sound increases as the instrument is more truly pointed. It is valuable on shipboard in a fog.

EOPTERIS, n. *ē-ŏp′tėr-ĭs* [Gr. *ēōs*, the dawn; *pteris*, a kind of fern]: in *paleon. bot.*, genus of Filices containing the oldest known fern. It is Silurian.

EOS: see Aurora (goddess).

EOSCORPIUS, n. *ē-ō-skawr′pĭ-ŭs* [*ēōs*, the dawn; *skorpios*, a scorpion]: in *paleon.*, genus of scorpions. *E. carbonarius*, from the carboniferous rocks of Ill., is the oldest known scorpion, except one found in the Niagara group.

EOSINE, n. *ē′o-sĭn* [Gr. *ēōs*, the morning-red, daybreak]: roseate dye-stuff, tetrabromo-fluorescin, $C_{20}H_8Br_4O_5$; obtained by the action of bromine on fluorescin dissolved in acetic acid.

EOSINOPHILES, *ē-ō-sĭn′ō-fīls*, one of the type is leucocytes or white blood-cells found in the circulating blood and characterized by its specific reactions to acid stains, such as eosine, whence its name—'a lover of eosine.' Eosinophiles are present in the proportion of one half to two per cent of the white blood-cells. Their increase above two per cent is termed EOSINOPHILIA, which seems to be an almost constant accompaniment of certain diseases, notably of infection by intestinal parasites. So it is in trichiniasis, in anchylostomiasis, and in infection by the ordinary tapeworm. Consult: Ewing, *Pathology of Blood* (1902).

EOSPHORITE, n. *ē-ŏs′fėr-īt* [Gr. *ēōs*, morning; *phoros*, bearing]: variety of childrenite.

EŌTHEN, *ē-ō′thĕn*, or TRACES OF TRAVEL BROUGHT HOME FROM THE EAST, a noted work by Alexander William Kinglake, published in 1844. *Eōthen*—a title meaning 'From the Dawn'—is a lively and acute narrative of travel in the East, at a time when that region was comparatively new ground to English tourists. The author, starting from Constantinople, visits the Troad, Cyprus, the Holy Land, Cairo, the Pyramids, and the Sphinx; thence by way of Suez he proceeds to Gaza and returns by the way of Nablous and Damascus. He apologizes for his frankness of style, and gives his impressions with refreshing directness, modified as little as possible by conventional opinion.

EOTHERIUM, n. *ē-ō-thēr′ĭ-ŭm* [Gr. *ēōs*, the dawn; *thērion*, a wild animal]: in *paleon.*, genus of Sirena, from the Eocene. *E. egytiacum* is the oldest known member of the Manatee order.

EÖTVÖS, *ā′öt-vösh*, JOZEF: 1813, Sep. 3—1871, Feb. 3; b. Buda: distinguished Hungarian author. He was educated at home by a tutor of republican sentiments, and studied philosophy and jurisprudence at the Univ. of Pesth 1825–31. He became an advocate 1833, but soon turned to literature, having already won reputation by his comedies *Kirtikusok* (The Critics) and *Házasulók* (The Weddings), and by his tragedy *Boszu* (Revenge). After his return from a journey through Germany, France, England, Switzerland, and the Netherlands, he published a work on *Prison Reform* (1838). This was followed (1838–41) by a novel, *The Carthusian*, pronounced one of the best productions of Hungarian literature. E. then began to distinguish himself in politics as a writer of incisive articles on the liberal side represented by Kossuth. *The Village Notary* (A' Falu' Jegyzöje, 1846; Eng. transl. 1850) is of the highest order, marked by variety of incident, easy vigor of style, humor, liveliness, and freshness of descriptive power. It was followed, 1848, by a powerful novel describing Hungary in 1514. When the revolution of 1858 broke out, E. was appointed minister of public instruction, but soon retired

to Munich, where he employed himself exclusively in literary pursuits. He died at Pesth.

EOZOON, n. *ē′ō-zō′ŏn* [Gr. *ĕōs*, dawn; *zōŏn*, an animal]: a structure believed to be a fossil foraminifer, which must have grown in sheets on the sea-bottom, though said by many to be of mineral origin. It occurs in certain limestones constituting reefs of rock in the Laurentian system of Canada. Dr. Dawson of Montreal named it Eozoon from its position in the oldest stratified rocks yet known to geology, and as being therefore the oldest known organism. See LAURENTIAN SYSTEM. E′OZO′IC, a. *-ĭk* [Gr. *zoē*, life]: a term applied to the oldest fossiliferous rocks of Canada, from their containing the earliest traces of life yet discovered; containing eozoon. The Laurentian system in Scotland has not as yet revealed any fossil remains. EOZOONAL, a. *ē-ō-zō′ŏn-al* [Eng. *eozoon*]: pertaining to or containing the fossil named Eozoon, or containing proof of the dawn of life. EOZOIC PERIOD: see ARCHÆAN PERIOD.

EP, prefix, *ĕp:* see EPI.

EPACRIS, n. *ĕp′ă-krĭs* [Gr. *epi*, upon; *ăkrŏs*, the top, as found on the tops of hills]: a genus of very elegant greenhouse plants, ord. *Epacrĭdāceæ*, having in leafy spikes abundance of white, red, or purple flowers. EPACRIDACEAE, *ĕ-păk-rĭd-ā′sē-ē*, natural order of exogenous plants, consisting of shrubs and small trees, which, both in appearance and in botanical characters, much resembles the *Ericeæ*, or Heath Family. About 400 species are known, all natives of the Indian Archipelago, the South Sea Islands and Australia, in which regions they seem to occupy the place of heaths of other parts of the world. Lindley has given the name Epacrids to this order. Some produce edible berries resembling cranberries.

EPACT, n. *ē′păkt* [Gr. *epaktos*, brought on or in, added —from *epi*, on; *agō*, I bring or lead to: F. *épacte*]: in *chronology*, excess of the solar month above the lunar synodical month; or of the solar year above the lunar year of 12 synodical months; or of several solar months above as many synodical months; or of several solar years above as many periods, each consisting of 12 synodical months. The menstrual epact is the excess of the civil calendar month above the lunar month. For a month of 31 days, this epact is 1 day 11 hours 15 minutes 57 seconds, if we suppose new moon to occur on the first day of the month. The annual epact is the excess of the solar year above the lunar. As the Julian solar year is (nearly) 365 days, and the Julian lunar year is (nearly) 354 days, the annual epact is nearly 11 days. The epact for two Julian years is, therefore, nearly 22 days; for three years, nearly 33 days; and so on. When, however, the epact passes 30 days, 30 falls to be deducted from it, as making an intercalary month. For three years, then, the epact is properly 3; and for 4 years, adding 11 days, it is 14 days; and so on. Following the cycle, starting from a new moon on Jan. 1, we find that the epact becomes 30 or 0 in the 19th year.

The epact for the 20th year is again 11; and so on. The years in the cycle are marked by Roman numerals, I. II. III., etc., called the Golden Numbers; and a table of the Julian epacts exhibits each year in the cycle with its golden number and epact. As the Gregorian year (see CALENDAR) differs from, and is in advance of, the Julian by 11 days (the number lost on the Julian account before the Gregorian computation of time was introduced into England and her colonies), and as 11 days is the difference between the solar and the lunar years, it follows that the Gregorian epact for any year is the same with the Julian epact for the year preceding it.

EPAGOGE, n. *ĕp-a-gō′jē* [Gr. *epi*, on; *agō*, I lead]: in *rhet.*, the bringing forward particular examples to prove a universal conclusion; the argument of induction. EPAGOG′IC, a. [Gr. *epagōgē*]: of the nature of or pertaining to induction; inductive.

EPAMINONDAS, *ē-pam-ĭ-nŏn′das:* B.C. 414—B.C. 362; most eminent of Theban generals and statesmen, and one who elevated and for a long period held his country at a high point of honor and prosperity. He was descended from an ancient but impoverished family, and led a retired life till his 40th year, profiting by the instructions of Lysis the Pythagorean, who inspired him with enthusiasm for elevated ideas. E. became prominent first during the period when the Lacedemonians garrisoned the citadel of Thebes, and kept the inhabitants in subjection. Though he took no part in the desperate but successful stratagem by which his fellow-citizens recovered the *Cadmeia*, B.C. 379, he stepped forward immediately afterward into the ranks of the patriots; and when sent to Sparta B.C. 371 with several others, to negotiate a peace between the two countries, Epaminondas evinced firmness, dignity, and eloquence in the debate which ensued on the question whether Thebes should ratify the treaty in the name of all Bœotia, the result of which ratification would have been equivalent to a recognition of her claim to supremacy over the Bœotian towns. To this the Lacedemonians demurred, and the war was resumed; Epaminondas was appointed commander-in-chief; and, in conjunction with his friend Pelopidas, with an army of 6,000 men, defeated double that number of the enemy at Leuctra (B.C. 371). Two years later, he and Pelopidas marched into the Peloponnesus, incited several of the allied tribes to fall away from Sparta, and then turned his arms against that city, which, however, was bravely defended by Agesilaus. On his return to Thebes, Epaminondas was accused of having violated the laws of his country, by retaining the supreme power in his hands beyond the time appointed by law; but was acquitted in consequence of his open and animated defense. In the spring of B.C. 368 the war was renewed with increased fury between Thebes and Sparta, and Epaminondas once more marched into the Peloponnesus, but did not accomplish much; and on his return home

was checked by Chabrias at Corinth. To atone for this unsuccessful undertaking, he advanced with 33,000 men into Arcadia, and joined battle with the main body of the enemy near Mantineia, B.C. 362. Epaminondas at the head of his troops, succeeded in breaking the Spartan Phalanx, but was mortally wounded in the breast by a javelin. Being told by the physicians that he would die as soon as the weapon was extracted, on receiving intelligence that the Bœotians had gained the victory, he is said to have torn out the javelin with his own hand exclaiming: 'I have lived long enough.' His moral purity, justice, and clemency are extolled by the ancients as much as his military talents; and it is expressly recorded of him, that he never uttered a lie, even in jest. Compare Bauch, *Epaminondas und Thebens Kampf um die Hegemonie* (Breslau, 1834); Pomtow, *Das Leben des E.* (1870).

EPANADIPLOSIS, n. *ĕp-ăn-a-dĭ-plō′sĭs* [Gr.—from *epanadiploō*, to make double, to repeat; *diploos*, double]: in *rhet.*, repetition; term applied to that figure in rhetoric by which the sentence ends with the same words with which it begins.

EPANALEPSIS, n. *ĕp-ăn-a-lĕp′sĭs* [Gr. *epi* and *analēpsis*, taking up again; repetition; *analambanō*, I take up again, I repeat]: in *rhet.*, figure of speech by which the same word or clause is repeated after a parenthesis.

EPANAPHORA, n. *ĕp-ăn-ăf′o-ra* [Gr. *epanapherō*, I bring back, I repeat]: in *rhet.*, figure in which a word or phrase is repeated at the beginning of successive clauses.

EPANARTHOSIS: same as EPANORTHOSIS.

EPANASTROPHE, n. *ĕp-an-ăs′tro-fĕ* [Gr. *epanastrephō*, I return]: in *rhet.*, figure in which the end of one clause is made the beginning of the next.

EPANODOS, n. *ĕp-an′odŏs* [Gr. *epi*, and *anodos*, a way up or back; *ana*, up; *hodos*, a way]: in *rhet.*, figure in which a sentence or member is inverted or repeated backward.—Epanodos is also a return to the principal heads or to the proper subject of a discourse after a digression, or in order to consider the topics separately and more particularly.

EPANODY, n. *ĕ-păn′ō-dĭ* [Gr. *epanŏdŏs*, a rising, a return—from *epi*, upon; *anŏdŏs*, a way up, a return]: in *bot.*, an abnormal condition in which an irregular flower reverts to a regular form.

EPANORTHOSIS, n. *ĕp-ăn-awr-thō′sĭs* [Gr. *epanorthoō*, I set straight; I correct—from *epi*, up; *anorthoō*, I set straight up; *orthos*, straight]: in *rhet.*, figure of speech by which a person recalls what he has said, in order to substitute stronger or more significant words.

EPARCH, n. *ĕp′ârk* [Gr. *eparchos*, the governor of a province—from *epi*, upon; *archē*, rule, supreme power]: the governor or prefect of a province in ancient Greece. EPARCHY, n. *ĕp′âr-kĭ*, a province or territory under a

governor; a territory or district in Russia. The modern kingdom of Greece is divided into provinces called *Nomarchies,* and a Nomarchy is subdivided into *Eparchies.*

EPAULEMENT, n. *ē-pawl′mĕnt* [F. *épaulement,* a shoulder-piece—from *épaule,* the shoulder—from mid. L. *spatŭla,* a shoulder]: in *siege-works,* a sidework to cover troops in flank, made of gabions, fascines, or bags of earth. The siege batteries are usually shielded, at one end at least, by epaulements, forming an obtuse angle with the main line of the battery. The object is to protect the guns and gunners from a flanking fire. The name is often given erroneously to the parapet of the battery itself, but it applies properly to the flanking return only. Sometimes the whole of a small or secondary earthwork, including the battery and its flanks, is called an epaulement; and sometimes the same name is given to an isolated breast-work intended to shield the cavalry emlpoyed in defending a body of besiegers. EPAULE, the shoulder of a bastion, where one of the faces and one of the flanks meet.

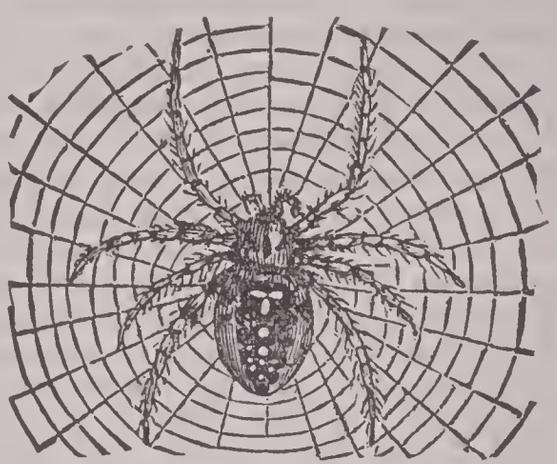
EPAULET, or EPAULETTE, n. *ĕp′aw-lĕt* [F. *épaulette*—from *épaule,* the shoulder—from mid. L. *spătŭlă,* a shoulder, a small sword: It. *spalla,* the shoulder]: ornament sometimes worn on the shoulder by naval and military men. EP′AULET′TED, a. furnished with epaulets.—Ranks and degrees are marked by means of anchors and stars worked on the epaulette; also by the size of the cords of the epaulette itself. In the British army, epaulettes were abolished during the Russian war, because of the danger to which officers thus conspicuously marked were exposed. They are retained by the French army alone of the armies of the great European powers.

EPAXIAL, a. *ĕp-ăks′ĭ-al* [Gr. *epi,* upon, over; Lat. *axis;* Gr. *axōn*]: in *anat.,* pertaining or relating to muscles lying above the embryonic vertebral axis. They are called by Huxley episkeletal muscles.

EPÉE, *ā-pā′,* CHARLES MICHEL, Abbé de L': 1712, Nov. 25—1789, Dec. 23; b. Versailles, France: one of the founders of the system of instruction for the deaf and dumb. He entered into holy orders, and became a preacher and canon at Troyes, but on account of his Jansenist opinions, was deprived of this appointment, and lived in retirement in Paris. In 1755, he began to occupy himself with the education of two deaf-mute sisters; and, as he asserts, without any previous knowledge of Pereira's efforts in the cause, invented a language of signs for persons thus afflicted. At his own expense, he founded an institution for deaf-mutes, and labored with unwearied zeal for it. His favorite wish, however, the foundation of such an institution at the public cost, was not fulfilled till after his death. He wrote *Institution des Sourds et Muets* (2 vols. Paris 1774), which afterward appeared in an improved form under the title, *La Véritable Manière d'Instruire les Sourds et Muets* (Paris 1784).

EPEIRA, *ē-pī′ra:* genus of spiders, type of a family

called *Epeiridæ*. They are of those spiders which have only a pair of pulmonary sacs and spiracles; construct webs with regular meshes, formed by concentric circles and straight radii, and are furnished with a pair of almost contiguous eyes on each side, other four eyes forming a quadrangle in the centre. Many of them are remarkable for beauty of colors and forms. Several species abound in gardens, particularly in autumn. *Epeira diadema* is one of the largest. It is found in moors, the borders of woods, etc.; but it is in tropical countries that the *Epeiridæ* are in greatest numbers, and attain the greatest size and beauty. The net, when loaded with wings, wing-covers, and limbs of insects that have been preyed upon, is often loosened, and falls down upon the central nest or



Epeira Diadema.

den of the spider; and successive nets thus falling down, form at last a ball sometimes as large as a man's head. Some of the spider cords, carried horizontally from tree to tree at a considerable height from the ground, 'are so strong as to cause a painful check across the face when moving quickly against them; and more than once,' Sir J. E. Tennent says, 'in riding I have had my hat lifted off my head with a single thread.'—Tennent's *Ceylon*.

EPENCEPHALIC, a. *ĕp-ĕn-sĕ-făl'ĭk* [mod. L. *epencephalon*]: in *anat.*, pertaining or relating to the epencephalon; the occipital or back part of the brain. EPENCEPHALON, n. *-sĕf'al-ŏn* [Gr. *epi*, upon; *engkephalos*, the brain]. in *anat.*, portion of the brain which, with the metencephalon, constitutes the posterior primary vesicle. The epencephalon comprehends the cerebellum, and the pons Varolii, with the anterior part of the fourth ventricle.

EPENCHYMA, n. *ĕp-ĕng'kĭ-mă* [Gr. *epi*, upon; *chumos*, juice]: in *bot.*, the fibro-vascular tissues.

EPENDYMA, n. *ĕp-ĕn'dĭ-mă* [Gr. *ependuma*, an outer or upper tunic—from *epi*, upon; *enduma*, clothing]: the delicate epitheliated structure which lines the canal of the spinal cord and the cerebral ventricles. EPENDYMA-VENTRICULORUM; same as EPENDYMA.

EPENTHESIS, n. *ĕ-pĕn′thĕ-sĭs* [Gr.—from *epi*, on or upon; *entithēmi*, I put or set in]: in *gram.*, the insertion of an additional letter or syllable in the middle of a word. Ep′enthet′ic, a. *-thĕt′ĭk*, inserted in.

EPERIES, *ā-pā-rē-ĕsh′* [Lat. *Fragopolis* or *Eperesinum;* Hung. *Eperjes;* Slovak, *Pressova*]: old town of Hungary, county of Saros, of which it is the capital; agreeably situated on the left bank of the Tarcza, about 150 m. n.e. of Pesth. It is surrounded with walls, is the seat of a bishop, and contains some houses of the 15th and 16th c., built in the style of those in Naples, with which Eperies was much connected in the middle ages. Its principal buildings are the church of St. Nicholas, the communal college, with 500 students and a library of 14,000 vols., and the county hall. It has manufactures of earthen ware and of linens and woolens, and has some trade in linen goods, grain, and Tokay wine. In the vicinity are the Sovar saltworks, which produce 5,000 tons of salt annually. Pop. about 11,000.

EPERNAY, *ā-pĕr-nā′:* town of France, dept. of Marne, headquarters of the *Vins de Champagne;* in the midst of a rich vine-growing district, on the left bank of the Marne, 19 m. w.n.w. of Chalons. It is well built, clean and well paved. Its environs consist, for the most part, of elegant villas, with vaults attached, belonging to the Champagne wine-merchants. Epernay manufactures large quantities of earthen-ware from a clay obtained in the neighborhood, and called *Terre de Champagne;* also hosiery, refined sugar, and leather. It has a brisk trade in bottles, corks, wire, champagne wines, etc. Pop. 20,000.

EPEXEGESIS, n. *ĕ-pĕks-ė-jē′sĭs* [Gr. *epexēgeomai*, to narrate in detail; *ex*, out; *hēgeomai*, to lead]: a full or detailed account or explanation of something which has gone before; exegesis. Epexegetical, a. *-jĕt′ĭk-al* [Gr. *epi*, and *exegetical*]: of the nature of an epexegesis; explanatory of something which has gone before; exegetical.

EPHEBIDÆ, n. *ē-fē′bĭ-dē* [Gr. *ephēbos*, a kind of cup]: family of lichens, tribe *Hymenothalameæ*. Ephebe is the type.

EPHEDRA, n. *ĕf′ĕ-dra* [L. *ephedra*—from Gr. *ephedra*, a setting by or at a thing, a plant, perhaps *Equisetum sylvaticum*]: genus of *Gnetaceæ*. The flowers are diœcious. The species occur in all parts of the world. The fruit is said to be mucilaginous, eatable, sub-acid, and slightly pungent. The branches and flowers of the Asiatic ephedras were formerly sold as styptics.

EPHELIS, n. *ĕ-fē′lĭs* [Gr. *epi*, upon; *hēlios*, the sun]: plural Ephelides: term for the freckles which appear in persons of fair complexion, on those parts of the skin exposed to the sun.

EPHEMERA, n. *ĕ-fĕm′ĕ-rā* [Gr. *ephēmĕrŏs*, lasting but a day—from *epi*, on; *hēmĕrā*, a day]: that which lasts but a

day; a fly that lives a day, or for a short period; in *med.*, a kind of fever (*febris diaria*) that lasts but a day or part of a day, usually arising from some local irritation. EPHEM'ERAL, a. *-ăl*, continuing or existing one day only; short-lived. EPHEMEREÆ, n. plu. *ĕf-ĕ-mĕr'ē-ē* [mod. L. *ephemerum;* L. adj. suff. *-eæ*]: tribe or family of inoperculate terminal foliated mosses. Ephemerum is the type. EPHEMERID, n. *ĕ-fĕm'ėr-ĭd*, insect of the family *Ephemeridæ*. EPHEM'ERIS, n. *-ĭs*, a daily account; an almanac containing the daily positions of the sun, moon, and planets, with useful information respecting the other heavenly bodies, and of such phenomena as depend upon them; a table of the positions of a heavenly body, as the *ephemeris* of the sun; such tables have become common since the days of Kepler. The first were published by Purbach for the years 1450-61. Those of Regiomontanus, for 1474, were much more accurate, and his Ephemerides met with universal acceptance. Similar publications were afterward made by Leovitius, Origanus, Kepler, and others. Among the most important of these numerous works at present are the French *Connaissance des Temps*, the English *Nautical Almanac*, the Berlin *Astronomisches Jahrbuch*, and the *American Ephemeris and Nautical Almanac*. EPHEMERIDES, n. plu. *ĕf'ĕ-mĕr'ĭ-dēz*. EPHEM'ERIST, n. one who studies the daily motions of the planets by means of an ephermeris. EPHEMERITES, n. *ĕ-fĕm'ėr-īts*, in *paleon.*, presumed genus of *Ephemeridæ* of Carboniferous age. EPHEMEROMORPH, n. *ĕ-fĕm'ėr-o-mawrf* [Eng. *ephemeron;* Gr. *morphē*, form]: term coined by Bastian, to include the lowest forms of life under one general designation. EPHEMERON-WORM, n. the ephemera which, however, continues long in the worm or larva state. It is when it reaches the perfect state that it is ephemeral in the duration of its life.

EPHEM'ERA [Gr. lasting for a day]: Linnœan genus of neuropterous insects, now forming the family or tribe *Ephemeridæ*. They are allied to the *Libellulidæ*, or Dragon flies, but differ from them in many very important respects. They have received their name, to which corresponds the English DAY-FLY, sometimes also applied to them, from the brief duration of their existence in the perfect state, in which, very unlike the dragon-flies, they are believed to take no food, merely propagating their species, and dying. From the season of the year in which they begin to be seen, some of them are also called MAY-FLY; and by this name are well known to anglers, who use them, and artificially imitate them as excellent lures for trout. The eggs also of the ephemeræ are favorite food of fishes; they cohere together in a gelatinous mass. The larvæ and pupæ are aquatic, and in these states the ephemeræ have much longer life than in their perfect state, extending even to years. The larvæ and pupæ are voracious. The abdomen of the larva is furnished on each side with a set of leaflets, which serve instead of gills for respiration, and are used also in locomotion,

though there are six fect attached to the thoracic segments. The pupæ differ little from the larvæ except in having rudimentary wings inclosed under scales. Both larvæ and pupæ have the abdomen terminated by two or three jointed filaments, which the perfect insect also has, sometimes very long. The body of the perfect insect is soft and slender; the wings resemble in form those of dragon-flies, but are soft and filmy; in rcpose, they are elevated vertically above the body: the second pair of wings are much smaller than the first, and in some species are altogether lacking; the organs of the mouth are so soft and small as not easily to be discerned, and to be apparently unfit for any kind of use. Ephemeræ, in their larva and pupa states, live chiefly under stones in water, or in burrows which they make in the banks of streams. When ready for their final change, they creep out of the water to undergo it on some plant or other object by the water-side, generally toward sunset on some fine day of summer or autumn. After having attained their winged state, however, they cast off a complete slough or envelope, so perfect, that it exhibits even the limbs, abdominal filaments, and antennæ; and these 'ghost-like exuviæ' are sometimes so abundant in the neighborhood of streams, as to cover in 'a pearly layer' the hat and basket of the angler. The multitudes of ephemeræ are often very great, filling the air as a cloud; nay, so abundant are they at times, that their bodies have been known to cover the ground in certain districts of France, and have been gathered from particular spots in cart-loads to be used as manure.

EPHESIAN, a. *ĕf-ē'zhĭ-ăn:* pertaining to *Ephesus:* N. a native of Ephesus, in Asia Minor.

EPHESIANS, Epistle to the: universally received as a genuine work of the apostle Paul. The only doubt in connection with it is whether it was addressed particularly to the church of Ephesus, or to some neighboring church or churches. Among the reasons for the doubt are: 1. Basil (became bp. of Cæsarea 370) says that the earlier writers whom he had consulted declared that in their copies of the epistle it was not addressed to any church by name; and that this was the fact also in the ancient manuscripts that he had seen. 2. In agreement with this testimony it has been discovered in recent times that the words 'in Ephesus' are not in the text of the Vatican and Sinaitic manuscripts, which are the oldest and best now known. 3. Marcion (wrote about 150) says that in his collection this epistle was addressed to the Laodiceans. But, as he was heretical in his opinions, and took strange liberties in matters relating to the Scriptures, his testimony is not to be trusted, unless confirmed by other witnesses. 4. In the epistle itself Paul says only that he had *heard* of the Christian faith of those whom he addressed; he seems also to imply that they may not have known of his mission as the apostle to the Gentiles; he sends no salutations to personal friends; and makes no allusion to his having ever lived among those to whom he wrote. These things are natural if the epistle was addressed to strangers, but hard to explain if it was

written to a church founded by his own personal labors and perils, whose members he had counselled faithfully for three years, and whose elders had parted from him at Miletus with tears. In view of these reasons some suppose that the epistle was originally sent in succession to several churches, one of which was at Ephesus, and another, perhaps, at Laodicea. But its usefulness did not at first depend on its particular destination; nor is it now less useful because that destination is not certainly known. The very absence of local allusions and restrictions may make it better adapted to instruct the churches of all times and in every land. I. The *doctrinal* part of the epistle (which is informal in its method, and exultant in its terms) exhibits: 1. The glorious character of God, the Father of all, in his love, justice, mercy, and grace in Christ, by whom he provides redemption for men, Gentiles and Jews, according to the revelation of his eternal purpose bursting forth first on the darkness of this world, and to be fully manifested, at last and forever, among the principalities and powers of heaven. 2. The resurrection of Christ from the dead, followed by his exaltation to supreme power over all things for the welfare and perfection of his church. 3. The lost state of sinful men from which redemption delivers those that believe. 4. The full knowledge and personal experience of the blessings provided for Christians to be attained, in answer to prayer, through the working in them of that mighty power by which Christ had been raised from the dead and exalted in heaven. II. The *practical* part exhorts Christians to strive for the attainment of: 1. Unity of the spirit among themselves. 2. Holiness of heart and conduct. 3. Loving fidelity in the various relations of life. 4. Persevering activity in maintaining the conflict against spiritual adversaries, through strength to be derived from the Lord, and in the use of the whole armor which he supplies.

EPHESITE, n. *ĕf'ĕ-sīt* [from *Ephesus*, in the vicinity of which it occurs]: pearly white mineral, hard enough to scratch glass.

EPHESUS, *ĕf'ē-sŭs:* one of the twelve ancient Ionic cities of Asia Minor, in Lydia, near the mouth of the river Caystrus, in the midst of an alluvial plain. It does not appear to have been as old as the Trojan war, but its primitive history has been confused by myths. It bore a great variety of names at different times, the principal of which, besides E., were Ortygia and Ptelea. According to Strabo, it was founded by Androclus, son of Codrus, and this is the most probable of the accounts which have come down to us, though others held to the tradition of its Amazonian origin. It was long before E. acquired any political importance, in spite of being a sacred city from an early period. Subdued first by the Lydian, and next by the Persian kings, it was included, after the death of Alexander the Great, in the territories of Lysimachus (B.C. 281), by whom it was greatly strengthened. Ultimately, it came into possession of the Romans; and in the time of

Augustus, when Strabo wrote, it was 'the greatest place of trade of all the cities of Asia w. of the Taurus.' This was its condition when visited by the apostle Paul, who resided here three years; but the destruction of its great temple by the Goths, A.D. 260, gave it a blow from which it never recovered. In 341, it was the scene of the *third* general council of the Christian Church. Its general history, while a city of the Byzantine empire, was unimportant, and before the days of Tamerlane it had almost completely perished.—The ruins of E. comprise a stadium 687 ft. long, fragments of a great theatre (alluded to in the account of the apostle Paul's preaching in the city), of an odeum or music-hall, and of various walls and towers, belonging to the Greek, Roman, and Byzantine eras. Near the w. extremity of the town are some massive structures, which have since 1868 been carefully excavated, at some spots, from beneath 18 ft. of soil. It is now certain that these stand on the site of the famous *Temple of Diana.* This marvellous building, one of the seven wonders of the world, was originally built by Chersiphron; but after its destruction by Herostratus on the night (as is said) when Alexander the Great was born (B.C. 356), it was rebuilt by the inhabitants in a style of greater splendor than before, the very women contributing their ornaments to secure the necessary funds; yet, notwithstanding this enthusiasm, more than 200 years elapsed before the new edifice was completely finished. It was the largest Greek temple ever constructed. Its length was 425 ft., its width 220, the number of its columns 128, of which 36 were carved, and their height 60 ft. It had an area more than four times that of the Parthenon at Athens, and even the Olympeium was only about two-thirds as great. But more wonderful than the temple itself were the numberless statues and pictures which it contained, executed by the best masters of Greece. The altar of the goddess was adorned principally with the works of Praxiteles. Certain cabalistic words, said to have been inscribed on the figure of Diana, were copied and carried about as charms. The vast temple, plundered of its treasures by Nero, and burned (as has been mentioned) by the Goths, was most likely finally destroyed by the iconoclasts, in the reign of Theodosius I., who issued his celebrated edict against the ceremonies of the pagan religion 381. The site of E. is now occupied by some wretched villages, the principal of which is Ayasaluk.—See the works of Guhl, Ernst Curtius, and Zimmermann, and Wood's account of his explorations in 1868–9.

EPHESUS, COUNCILS OF: two ecclesiastical assemblies. I. The third ecumenical council was summoned by Emperor Theodosius II. to meet about Pentecost, 431, to settle a complicated controversy, involving the following: 1. Differences of philosophical statement concerning the union of the divine and human natures in Christ; 2. Strife among bishops and churches, aggravated by their ambition and jealousy, and by assumed imperial authority over them;

3. The homage increasingly rendered to Mary, the mother of Jesus, expressed in part by calling her 'the mother of God.' This controversy found its centre in Nestorius, bp. of Constantinople, who opposed the title 'mother of God,' but was willing to say 'mother of Christ.' At the time appointed many of the bishops were present, but some were detained by bad roads and other hindrances. After waiting two weeks the majority (consisting of 160 bishops), under the arbitrary lead of Cyril, bp. of Alexandria, having organized the council, condemned Nestorius and deprived him of his office. The detained bishops having arrived soon after, both sides appealed to the emperor, who permitted Nestorius to return to the monastery from which he had been called. II. The 'Robber Synod' (as history justly calls it), consisting of 135 bishops; convened by Theodosius (449) to consider again the controversy to which Nestorius gave name, and which, since his deposition, had become even more violent. In the proceedings of this council no opposition to the will of the president, Dioscuros, bp. of Alexandria, was allowed; the bishops were overawed by monks, soldiers, and brawny servants, and were compelled to sign *blank* papers, to be filled up as the leaders chose. These lawless methods, as well as the violent measures carried through by their aid, hastened a crisis in the Eastern Church, and greatly furthered the advancing power of the bp. of Rome, by compelling an appeal to him against oppression and wrong.

EPHIPPIUM, n. *ĕ-fĭp'pĭ-ŭm* [L.—from Gr. *ephippion*, anything placed on a horse's back, such as a horse-cloth, or a saddle; *epi*, upon; *hippos*, a horse]: in *zool*, a receptacle on the back of the entomostrocan called Daphnia, in which the winter eggs are deposited.

EPHOD, n. *ĕf'ŏd* [Heb.]: vestment worn by the Jewish high-priest over the *Mĕīl* or second (purple) tunic. It consisted of two shoulder-pieces, one covering the back, the other the breast and upper part of the body, not unlike the Greek *epōnis*. Two onyx stones set in gold fastened it on the shoulders, and on each of the stones were engraved the names of six tribes, according to their order. The material of which the E. was wrought was extremely costly and magnificent: 'gold, blue, purple, crimson, and fine twined linen.' A girdle or band, of one piece with the E., fastened it round the body. Just above this girdle, in the middle of the E., and joined to it by little gold chains, rings, and strings, rested the square oracular breast-plate with the mysterious *Urim and Thummim*. See HIGH-PRIEST: URIM AND THUMMIM.

Originally intended to be worn by the high-priest exclusively: ephods of inferior material seem to have been in common use in later times by the ordinary priests. Even David, when bringing the ark back to Jerusalem, appeared in one. There is mention made of an ephod also in several passages of the books of Judges and Samuel, where the word must needs stand either for the *whole* priestly apparatus of an illegal service, or simply for a

statue or an idol: the Talmud understands this E. to have been a colossal shoulder vestment of gold, to which divine honors were rendered.

EPHOR, n. *ĕf′ŏr*, EPHORI, n. plu. *ĕf′ŏr-ī* [Gr. *ephorăō*, I look at or over]: order of magistrates in ancient times which appears to have originated at Sparta, and to have been peculiar to the Doric governments. When or by whom the ephori were first instituted is uncertain. Herodotus attributes their creation to Lycurgus, and Aristotle to Theopompus (B.C. 770–720). Their duty was to superintend the internal administration of the state, especially affairs of justice, for which a particular building was assigned them, called the Ephorion. One of their most important functions was the oversight, at least in part, of the education of youth, for we are told by Athenæus that they inspected the clothing and bedding of the young men. The ephori were five in number; they were elected by and from the people—on which Aristotle observes, that through them the *demos* enjoyed a participation in the highest magistracy of the state; and held their office for only one year. Their influence gradually increased, for their powers were so ill defined that it was difficult to say what was *not* under their cognizance and authority. Cicero draws a comparison between the ephoralty of Sparta and the tribunate of Rome, which is not unwarranted by the facts of the case. Ultimately, the kings themselves became subject to the supervision of the ephori. Cleomenes, for example, was brought before them for bribery; Agesilaus was fined, and Pausanius imprisoned; and in extreme cases they could prefer charges against the kings, and have them tried before the supreme criminal court. They also transacted negotiations with foreign powers, subscribed treaties, raised troops, 'intrusted the army to the king or some other general,' and, in fact, acted as the executive of the state. Muller regards the ephoralty as 'the principal of change in the Spartan constitution, and, in the end, the cause of its dissolution.' In the hands of the ephori, the constitution of Sparta certainly ceased to be a genuine aristocracy, and became a sort of oligarchy; but the subject is involved in obscurity and perplexity. Their authority was at last destroyed by Agis and Cleomenes, who murdered the ephori then ruling, and restored the old Spartan constitution, B.C. 225.

EPHRAEM SYRUS, *ē′fra-ēm sī′rŭs*, EPHREM, or EPHRAM (the Syrian), Syrian theologian: b. Nisibis, Mesopotamia; d. Edessa 378. He lived in Nisibis till 363, but thereafter in Edessa till he died, except intervals which he spent in prayer and meditation in the desert. He held humble rank in the hierarchy, that of deacon, but as a preacher attained high celebrity. He refused to be ordained a priest because he thought himself unworthy. His writings were very numerous, and many are extant. He used a poetic form in his homilies and harangues; and St. Jerome tells us that his homilies (translated into

Greek, for he wrote in Syriac) were wont to be read in many of the churches of Greece immediately after the Scripture lesson. He was a valiant defender of Catholic orthodoxy against the heretics of his time—Bardesanes, the Gnostic, the Arians, and the Sabellians, the Manichæans and the Novatians. Some of his lyrics are remarkable for their simplicity and genuine poetic spirit. Even his homilies are of a poetic cast and form; and in the translation of some of them they are styled 'rhythms.'

EPHRAIM, *ē'fra-ĭm:* younger son of the Hebrew patriarch Joseph by his wife Asenath, and the founder of one of the 12 tribes of Israel. It is possible that he may have received his name, which signifies 'double fruitfulness,' from having been born during the seven years of plenty. His gandfather, Jacob, shortly before his death, prophesied the greatness of his posterity when giving him his blessing: 'His seed shall become a multitude of nations' (Gen. xlviii 19). After the Israelites had left Egypt, the tribe of Ephraim numbered 40,500, (Numbers, i. 32, 33); but from causes not specified, and not discoverable, it had sunk 40 years later, on the eve of the conquest of Canaan, to 32,500 (Numbers, xxvi. 37). Yet it was under the leadership of an Ephraimite, Joshua, the son of Nun, that the Canaanites were subjugated, and the land possessed. This seems to have given the tribe a much higher influence than might have been expected from its numerical strength. We find Judah and Ephraim classed together as taking their inheritance first (Josh. xv. xvi., etc.).—The precise boundaries of Ephraim, as of the other tribes it is impossible to determine. It occupied the centre of Palestine, was bounded on the s. by Dan and Benjamin, and stretched from the Jordan on the e. to the Mediterranean on the west. From scattered notices of the Ephraimites in the earlier annals of the Hebrews, we infer that they were, on the whole, jealous of their brethern. This feeling of dissatisfaction at length broke out into rebellion in the reign of Rehoboam, and the new kingdom of Israel, ruled over by Jeroboam, was for the most part merely the kingdom of Ephraim, for the land which lay n. of it could hardly be said to be actually in the possession of the tribes whose names it bore, the original inhabitants keeping stubborn hold of their cities and strongholds. See JEWS.

EPH'RATA, Pa.: township and borough in Lancaster county; on the Reading & C. R.R.; about 50 miles northwest of Philadelphia. It is an agricultural and mining region with forests nearby. Ephrata was founded by Johann Conrad Beissel and his followers in 1735. The community established by Beissel was called 'Order of the Solitary,' and it resembled somewhat the Seventh-Day Adventists. Ephrata contains several very ancient and singular buildings, particularly the brother and sister house. These houses are large four-story structures, each contains a chapel, and is divided into small apartments, so that six dormitories, barely large enough to

contain a cot, a closet, and hour glass, surround a common room, in which each mess have their meals. The dress of the brethren and sisters is that of the Franciscans, or White Friars. They are remarkable for their rigid adherence to the precepts and ordinances of the New Testament; they insist upon the washing of the feet before administering the sacrament; and are very observant of the Sabbath. They are peaceful and temperate and are distinguished for their music, which is composed and arranged by themselves. Prior to the Revolution they seemed to flourish, but now only a few of the order remain in Ephrata. Pop. 2,500. Consult: Kuhns, *German and Swiss Settlements of Colonial Pennsylvania;* Sachse, *The German Sectarians of Pennsylvania*, (2 vol).

EPHYRA, n. *ĕ'fī-ra* [L. *Ephyra;* Gr. *Ephura*, old name of Corinth]: pseudo-genus of *Rhizostomidæ*, being the 'hydratuba' or larva state of *Aurelia* or other true genera of the family; genus of geometer moths.

EPI, prefix, *ĕp'ĭ* [Gr.]: on; upon; during; on the outside or above: *epi* has the forms *ep* and *eph; ep* is used before a vowel, *eph* with an aspirate, and *epi* before a consonant.

EPI, *ĕp'ī*, or GIROU'TTE, *jĭr-ô-ĕt'* [Fr.]: species of ornamental ironwork with which the cones of pavilions or pointed roofs are sometimes surmounted in the renaissance style of architecture.

EPIBLAST, n. *ĕp'ĭ-blăst* [Gr. *epi*, upon; *blastos*, a shoot]: an abortive organ in the oat, supposed to be the rudiment of a second cotyledon.

EPIBLEMA, n. *ĕp'ĭ-blē'mă* [Gr. *epiblēma*, an upper garment, a patch—from *epiballō*, I put on—from *epi*, upon; *ballō*, I throw, I cast]: an imperfectly formed epidermis covering the newly formed extremities of roots, etc., being as it were, the tissue that first covers wounds.

EPIC, a. *ĕp-ĭk* [L. *epĭcŭs;* Gr. *epĭkŏs*, epic—from Gr. *ĕpos*, a song: It. *epic:* F. *epique*]: narrative; heroic. EPIC POEM, a poem that contains a narrative or story.—The two chief kinds of poetry, are Epic poetry and Lyric poetry. Epic poetry has outward objects for its subject, of which it gives an imaginative narrative. The events themselves may be partly real and partly fictitious, or they may be altogether fictitious. Lyric poetry, on the other hand, sets forth the inward occurrences of the writer or speaker's own mind—his feelings and reflections. No composition, perhaps, answers, in all its parts, to the one of these descriptions, or to the other; but a poem is classed as epic or lyric according to the element that predominates. Under each of these grand divisions, or genera, there are subdivisions, or species. The longer poems of the epic genus embrace an extensive series of events, and the actions of numerous personages. The term *heroic* epic, or *heroic* poem, is properly applied to such works as the *Iliad* and *Odyssey* of Homer, Virgil's *Æneid*, Tasso's *Jerusalem Delivered*, and Ariosto's *Orlando Furioso*, which

describe the achievements of the gods and heroes of antiquity, or of the almost equally mythic knights of mediæval chivalry. Poems like Milton's *Paradise Lost* and Dante's. *Divina Commedia*, are *sacred* epics. Productions like those now named form the class of grand epics, or epic poems, by way of eminence. But there are also several species of minor poems which may be ranked as epics. One of these is the *Idyl*, a term applied to what is called *pastoral poetry*, or to descriptions in general of natural scenery, and of the actions and manners of men in calm, ordinary life. Burns's *Cotter's Saturday Night*, Goldsmith's *Deserted Village*, and most of Crabbe's poems, are idyls; so are poetical epistles. The *ballad* (q.v.) is another species of minor epic. Attempts at epic poetry are now rare, the spirit of the age being against that form of composition. Instead of epic poems, we have *novels*, which may be considered as the epics of modern civil and domestic life.

EPICALYX, n. *ĕp′ĭ-kā′lĭks* [Gr. *epi*, upon; Eng. *calyx*]: the outer calyx, consisting either of sepals or of bracts, as in mallows, or probably of stipules of the sepaline leaves.

EPICARP, n. *ĕp′ĭ-kârp* [Gr. *epi*, upon; *karpos*, fruit] the outer skin of fruits—the fleshy or edible portion being called the *sarcocarp*, and the stone the *endocarp*.

EPICENE, a. *ĕp′ĭ-sēn* [L. *epicœnus*, of both sexes—from Gr. *koinos*, common]: in *gram.*, common to both sexes. EPICENE NOUNS, names of animals which take their gender from their termination without regard to sex.

EPICHARMUS, *ĕp-ĭ-kâr′mŭs:* Greek poet; b. in the island of Cos, B.C. 5th c. At first, he studied philosophy under Pythagoras; but a residence at Megara, the native soil of comedy, gave him a taste for that branch of the drama. After the destruction of Megara, B.C. 484, he removed to Syracuse, where, at the court of Hiero, he spent the remainder of his life. From this circumstance, he is often mentioned by the ancients as a Sicilian. Almost nothing else is known of his personal history except that he died at the age of 90, or, as some say, 97: the date is unknown, Epicharmus is called by Theocritus the father of comedy, and Plato assigns him a place among comic writers as high as that of Homer among epic poets. He certainly did good service in excluding, to a large extent, from his dramas the vulgar buffoonery which disgraced all previous comedies, and in introducing a regular plot in which the *comus* or band of revellers sustained the dialogue. None of Epicharmus's works survive entire; but we possess several fragments and the titles of 35. They embrace a wide variety of topics, mythological, social, and political. From one of them, Plautus borrowed the plot of his *Menœchmi*, which shows great constructive skill. The fragments of Epicharmus have been collected and edited by H. P. Krusemann (Haarlem 1834). Compare Lorenz, *Leben u. Schriften des Epicharmus* (1864), and Guigniant, *Histoire de la Comédie Antique* (1863).

EPICHILIUM, n. *ĕp′ĭ-kĭl′ĭ-ŭm* [Gr. *epi*, upon; *cheilos*, a lip]: in *bot.*, the upper portion of the lip of any orchidaceous plant when this organ is divided into two parts which are dissimilar in appearance.

EPICHIREMA, n. *ĕp-ĭ-kī-rē′ma* [Gr. *epicheireō*, I attempt; I put my hand to; *epi*, upon; *cheir*, the hand]: in *rhet.* and *logic*, syllogism in which the proof of the major or minor premise, or both, is introduced with the premises themselves, and the conclusion is drawn in the usual way.

EPICHLORHYDRIN, n. *ĕp-ĭ-klōr hī′drĭn* [Gr. *epi*, upon; Eng. *chlorhydrins*]: in *chem.*, glycidic hydrochloride, C_3H_5ClO or $O<\begin{matrix}CH_2\\|\\CH\\|\\CH_2Cl\end{matrix}$. It is isomeric with mono-chloracetone, $CH_2Cl.O.CH_3$. Epichlorhydrin is obtained by adding finely powdered caustic soda slowly to dichlorhydrin, but the temperature must not rise above 130°. Then it is distilled. E. is a colorless liquid insoluble in water; it boils at 117°; soluble in alcohol and in ether. It unites with fuming hydrochloric acid, forming symmetrical dichlorhydrin, $CH_2Cl{\cdot}CH(OH){\cdot}CH_2Cl$. By long boiling with water it is converted into monochlorhydrin. Nitric acid converts it into chlor-lactic acid, $CH_2Cl{\cdot}CH(OH){\cdot}CO{\cdot}OH$.

EPICHLORITE, n. *ĕp-ĭ-klōr′īt* [Gr. *epi*, upon, over, with; Eng. *chlorite:* named to suggest that it is allied to chlorite]: dull green mineral with a white or greenish streak, and greasy lustre. It occurs fibrous or columnar. Found at Harzburg.

EPICLINE, n. *ĕp′ĭ-klīn* [Gr. *epi*, upon; *klinē*, a bed]: in *bot.*, the nectary when placed on the receptacle of the flower. EPICLINAL, a. *ĕp′ĭ-klī′năl*, seated on the disk or receptacle.

EPICOROLLINE, n. *ĕp′ĭ-kŏr′ŏl-lĭn* [Gr. *epi*, upon; Eng. *corolline*]: in *bot.*, inserted upon the *corolla*.

EPICRANIUM, n. *ĕp′ĭ-krā′nĭ-ŭm* [Gr. *epi*, upon; *kranion*, the skull]: the scalp or integuments lying over the cranium. EPICRANIAL, a. *ĕp′ĭ-krā′nĭ-ăl*, applied to the muscle which extends over the upper surface of the cranium its centre usually being aponeurotic.

EPICTETIAN, a. *ĕ-pĭk-tē′shĭ-an:* of or relating to Epictetus.

EPICTETUS, *ĕp-ĭk-tē′tŭs:* celebrated Stoic philosopher: b. Hierapolis, in Phrygia, about A.D. 50. He was at first the slave of Epaphroditus, a freedman of Nero, at Rome, whose abusive treatment he is said to have endured with the composure characteristic of the sect to which he belonged. He was afterward manumitted, and applied himself to the Stoic philosophy. Domitian hated him on account of his principles, and banished him along with several other philosophers, from Rome. E. settled

at Nikopolis, in Epirus. His *Handbook* is a short moral catechism, the chief proposition of which is, learn to distinguish between what is, and what is not, in one's power. It is not in man's power to make the soul independent of all external things, therefore he should renounce what he cannot obtain, endure patiently what he must suffer, and, so far as is possible, find all his satisfactions within himself, in the development of virtue and character. Most of all, he should recognize God in his heart. While his views are similar to Christianity, there is not a shred of evidence to show that he was in the least influenced by, or even acquainted with, Christianity. The nobility and moral earnestness of Epictetus, and the dignity and simplicity of his style, have made him a favorite with many not otherwise interested in philosophy. The most complete edition of his works is that by Schweighaüser, Leipzig (1800). English translations by G. Long (Bohn's Library), and T. W. Higginson (Boston 1865).

EPICURE, n. *ĕp'ĭ-kūr* [L. *Epĭcūrŭs;* Gr. *Epĭkouros,* Epicurus, a Greek philosopher, who taught but in a different sense, that 'pleasure is the highest good']: a man who indulges in the luxuries of the table; a dainty eater. Ep'icure'an, a. *-kū-rē'ăn,* luxurious: N. a disciple of Epicurus. Ep'icurism, n. *-rĭzm,* luxury; habits of gross indulgence. Ep'icure'anism, n. *-rē'ăn-ĭzm,* or *kū'rē-ăn-ĭzm,* the doctrines of Epicurus. Ep'icurize, v. *-rīz,* to become an epicure; to play the epicure. Ep'icuri'zing, imp. Adj. tending toward the doctines of Epicurus.—Syn. of 'epicure': gourmand; voluptuary; sensualist.

EPICURUS, *ĕp-ĭ-kū'rŭs*—EPICUREANISM, *ĕp-ĭ-kū'rē-an-ĭzm,* or *-rē'an-izm:* an illustrious Greek philosopher, and his system. Epicurus: b.c. 341—b.c. 270; b. in the island of Samos, seven years after the death of Plato. His father, Neocles, is said to have been a schoolmaster, and his mother, Chœrestrate, to have practiced arts of magic. At the age of 18 he went to Athens, where it has been supposed that he may have had for his teacher Xenocrates or Theophrastus, or perhaps both, but he himself used to declare that he was self-taught. Of the older philosophers, he was most attached to Anaxagoras and Democritus, his system of physics being evidently built upon the atomic speculations of the latter. Epicurus's stay at Athens on this occasion was short. At Mitylene, in his 32d year, he first opened a school; and there and at Lampsacus he taught for five years. In b.c. 306, he returned to Athens, and established a school of philosophy in a garden which he purchased and laid out for the purpose. From this circumstance, his followers were called the 'philosophers of the garden.' Although Epicurus laid down the doctrine, that *pleasure* is the chief good, the life that he and his friends led was one of the greatest temperance and simplicity. They were content, we are told, with a small cup of light wine, and

EPICTETUS.
50? A.D.—125? A.D.

all the rest of their drink was water; and an inscription over the gate promised to those who might wish to enter no better fare than barley-cakes and water. The chastity of Epicurus was so incontestable, that Chrysippus, one of his principal opponents, in order to deprive him of all merit on the score of it, ascribed it to his being without passions. The calumnies which the Stoics circulated concerning him are undeserving of notice, and were at no time generally believed. Epicurus's success as a teacher was signal; great numbers flocked to his school from all parts of Greece, and from Asia Minor, most of whom became warmly attached to their master, as well as to his doctrines, for Epicurus seems to have been characterized not less by amiability and benevolence than by force of intellect. He died in the seventy-second year of his age.

The only writings of Epicurus that have come down to us are three letters, and a number of detached sentences or sayings, preserved by Diogenes Laertius, in his life of the philosopher. The principal sources of our knowledge of the doctrines of Epicurus, besides the above letters, etc., are Cicero, Seneca, and, above all, Lucretius, whose great poem, *De Rerum Natura*, contains substantially the Epicurean philosophy.

Although the majority of Epicurus's writings are said to have referred to *natural* philosophy, yet he was not a *physicist*, properly speaking. He studied nature with a *moral* rather than with a *scientific* design. According to him, the great evil that afflicted men—the incubus on human happiness—was FEAR; fear of the gods and fear of death. To get rid of these two fears, was the ultimate aim of all his speculations on nature.

The following is a brief account of his views. Epicurus regarded the universe (*Tó Pān*) as corporeal, and as infinite in extent, and eternal in duration. He recognized two kinds of existence—that of bodies, and that of *vacuum*, or space, or the intangible nature. Of his bodies, some are compounds, and some atoms or indivisible elements, out of which the compounds are formed. The world, as we now see it, is produced by the collision and whirling together of these atoms. He also held the doctrine of perception by *images* (Gr. *eidōla*) which are incessantly streaming off from the surface of all bodies, and which are necessary to bring us into *rapport* with the world without. In like manner, he believed that sounding bodies threw off emanations, by which we are brought into sympathy with them; and that perception by smell took place in the same way. In psychology, Epicurus was a decided materialist, holding, for various reasons, that the soul is a bodily substance, composed of subtile particles, disseminated through the whole frame, and having a great resemblance to spirit or breath with a mixture of heat.

In seeking to understand the phenomena of the heavens, Epicurus has no scientific end in view; his sole object is to enable the mind to account for them to itself, with-

out the necessity of imagining any supernatural agency at work. 'The phenomena of the heavens,' says Epicurus, 'admit of various causes being assigned for their production, equally conformable to the facts learned from the senses. If, then, in thinking of any appearance, we suppose it brought about by the same cause that produces another appearance which gives no alarm or uneasiness, we are as much delivered from uneasiness as if we *saw* that such is the cause of it.' Epicurus did not deny that there are gods, but he strenuously maintained, that as 'happy and imperishable beings,' they could have nothing to do with the affairs of the universe or of men. 'Beware,' he says, 'of attributing the revolutions of the heaven and eclipses, and the rising and setting of stars, either to the original contrivance or continued regulation of such a being. For business, and cares, and anger, and benevolence, are not accordant with happiness, but arise from weakness, and fear, and dependence on others.'

Epicurus next proceeds to deal with the fear of death. Having proved in his psychology that the dissolution of the body involves that of the soul, he argues that the most terrible of all evils, death, is nothing to us, 'since *when we are, death is not; and when death is, we are not.* It is nothing, then, to the dead or the living; for to the one class it is not near, and the other class are no longer in existence.' Whether Epicurus actually succeeded in removing the terrors of death by his syllogism, may be doubted.

As to the *positive* part of Epicurus's system, he held that *pleasure* was the chief good, and it is from a misapprehension of the meaning of this word as used by Epicurus that the term Epicurean came to signify one who indulged his sensual appetites without stint or measure. At the same time, it is easy to see that the use of the word 'pleasure' was likely to produce the mischievous results with which the later Epicureanism was charged. According to Epicurus, the sources and tests of all ethical truth are the feelings (*pathe*), and these are two, pleasure and pain. We delight in the one, and avoid the other instinctively. 'When we say that pleasure is the end of life, we do not mean the pleasures of the debauchee or the sensualist, as some from ignorance or from malignity represent, but freedom of the body from pain, and of the soul from anxiety. For it is not continuous drinkings and revellings, nor the society of women, nor rare viands, and other luxuries of the table, that constitute a pleasant life, but sober contemplation that searches out the grounds of choice and avoidance, and banishes those 'chimeras that harass the mind.' But, on the other hand, Epicurus says: 'If the means to which sensualists owe their pleasures dispelled the anxieties of the mind . . . . and enabled them to set limits to their desires, we should have no grounds to blame them for taking their fill of pleasure, wherever they could find it, provided it were attended

with no pain or grief from any quarter; for that is the only evil.' The whole question of ethics, then, comes to a calculation and balancing of pleasures and pains; in other words, the cardinal virtue is a selfish *prudence*. Epicurus rests *justice* on the same prudential basis as temperance. Denying any abstract and eternal right and wrong, he affirms that injustice is an evil, because it exposes the individual to disquietude from other men; justice is a virtue, because it secures him from this disquietude. 'Injustice is not an evil in itself, but becomes so from the fear that haunts the injurer of not being able to escape the appointed avengers of such acts.'

The duties of friendship and good fellowship are inculcated, not merely on the ground of security to the individual, but also of affording him directly a large amount of pleasure. Though inspiring men to be courteous gentlemen, the motive for this is always selfish pleasure, and Epicurus discourages the formation of ties which might bring grief and disappointment, such, for instance, as marriage, and the rearing of children. In practice, of course, Epicurus and his followers were far more altruistic than the strict logic of their system admitted.

Among the Romans, the system of Epicurus was adopted by many distinguished men. Horace, Atticus, and Pliny the Younger, were Epicureans; and the splendid poem of Lucretius must have recommended the system to many. In modern times, Epicureanism was resuscitated in France by Pierre Gassendi, who published an account of Epicurus's life and a defense of his character 1647. Many eminent Frenchmen have professed his principles, though in considerably modified form; among others, Molière, Saint Evremond, Count de Grammont, the Duke of Rochefoucauld, Rousseau, Fontenelle, and Voltaire; and his general attitude toward life has doubtless never lacked practical development in all lands.

See M. Guyav, *La Morale d' Epicure* (Paris 1878); P. V. Gizycki, *Ueber das Leben und die Moralphilosophie des Epikur* (Berlin 1879); W. Wallace, *Epicureanism* (London 1880); W. L. Courtney, *Epicurus in Hellenica*. Walter Pater's *Marius the Epicurean* is an accurate portraiture of the spirit and attitude of the school.

EPICYCLE, n. *ĕp'ĭ-sī'kl* [Gr. *epi*, upon; *kuklos*, a circle], a little circle whose centre is on the circumference of a greater circle. The earlier astronomers assumed that all the motions of heavenly bodies took place in circles, the circle being held to be the most *perfect* of all curves; and a necessary consequence of this assumption was, that the motions must have a uniform velocity. Another part of the hypothesis was, that all the heavenly bodies moved round the earth, which remained at rest in the centre. The observed phenomena of the heavens, however, were soon seen to stand in glaring inconsistency with these assumptions; and to remedy this, it was necessary to have recourse to additional assumptions. For the sun and moon, which manifestly do not always move with the same velocity, the

Eccentric Circle was imagined. The case of the planets, whose motions were seen to be sometimes direct, sometimes retrograde, and sometimes altogether arrested, offered still greater difficulties; to surmount which, the idea of *epicycles* was hit upon. According to this hypothesis, while a planet was moving in a small circle, the centre of that small circle was describing a larger circle about the earth. This larger circle was called the *deferent*, and the smaller, which was borne upon it, was called the *epicycle*. In this way the motions of the planets about the earth were conceived to be something like what the motion of the moon about the sun actually is. By assuming proper proportions between the radii of the deferent circle and the epicycle, and between the velocities of the two motions it was found possible to account approximately for the above-mentioned appearances and irregularities in the motion of the planets. But it is only the irregularities arising from the revolution of the earth about the sun that can be at all explained in this way, and not those arising from the elliptic motions of the planets about the sun, nor the inequalities of the moon's motions. The successors of the Greek astronomers, down to Tycho Brahé, continued, therefore, to increase the number of epicycles, setting one circle upon another, until the hypothesis, in itself complicated, became still more so, filling the heavens with a mazy dance of stars, in striking contrast to the simplicity of the Copernican system. Ep'icy'cloid, n. *-kloyd* [Gr. *eidos*, form]: peculiar curve described by a point in the circumference of one circle when moving over the convex or concave part of the circumference of another. When a circle moves upon a straight line, any point in its circumference describes a cycloid (q.v.); but if the circle move on the convex circumference of another circle (i.e. if the circle be an epicycle), every point in the plane of the first circle describes an epicycloid; and if on the concave circumference, a hypocycloid. The circle that moves is the generating circle; the other, the base. The describing point is not necessarily in the circumference of the generating circle, but may be anywhere in a radius or its prolongation. This curve was investigated first by the Danish astronomer Römer. It has many remarkable properties, and is even useful in the practical arts. The teeth of wheels in machinery must have an epicycloidal form, in order to secure uniformity of movement. Ep'icycloid'al, a. pertaining to. Epicycloidal wheel, a wheel for converting circular into alternate motion, or the reverse.

EPIDAM'NUS: see Durazzo.

EPIDAURUS, *ĕp-ĭ-daw'rŭs:* town of ancient Greece, on the e. shore of the Peloponnesus, in the district of Argolis, on a small promontory, 15 stadia in circumference, in the Saronic Gulf; lat. 37° 38′ n., long. 23° 10′ e. During the most prosperous period of Grecian history Epidaurus was an independent state. It was colonized first, it is

supposed, by Carians (hence the older name of *Epicarus*, according to Aristotle), and afterward by Ionians, but was subsequently invaded by a Dorian army under Deiphontes, son-in-law of Temenus the Heracleide. This force dethroned Pityreus, the Ionian king of Epidaurus, compelled him and his citizens to retire to Athens, and inaugurated the Dorian rule, which preserved the ascendancy at Epidaurus during the whole historical period. The form of government was originally monarchical, but after many vicissitudes, it eventually became and remained oligarchical. At an early period, Epidaurus became one of the chief commercial cities of the Peloponnesus. It colonized the islands of Cos, Calydnus, and Nisyrus, as well as the town of Ægina, which, during the 6th c., attracted all the commerce from the then declining mother-city. Epidaurus, was famous chiefly for its temple of Æsculapius, to which patients resorted from all parts of the Hellenic world, seeking cures. The site of this temple was a plain surrounded by mountains, about 5 m. w. of the town, and which is still called Hieron, the sanctuary. Epidaurus had also numerous temples, among which were those of Artemis, Dionysus, Aphrodite, and Hera, and a magnificent theatre, at present in a more perfect state of preservation than any in the Peloponnesus, and with sufficient accommodation for 12,000 spectators.

Epidaurus (modern Greek, *Epidavro*) is now a small village, with scarcely 100 inhabitants, employed for the most part in raising vegetables for the Athenian market. The plain surrounding the village is productive and highly cultivated. Here, 1822, Jan., a congress from all parts of Greece assembled, and promulgated the constitution, known as the constitution of Epidaurus.

EPIDEICTIC, a. *ĕp-ĭ-dīk′tĭk*, or EPIDEIC′TICAL, a. *-ăl* [Gr. *epideiknumi*, to show off—from *epi*, and *deiknumi*, to show]: showing off; displaying; specifically, applied to elaborate eulogiums or set orations, such as were frequent with the Athenian orators, and of which Socrates gives the best examples.

EPIDEMIC, a. *ep′ĭ-dĕm′ĭk*, or EP′IDEM′ICAL, a. *-ĭ-kăl* [Gr. *epi*, upon; *dēmŏs*, the people: F. *épidémique*]: attacking many persons; prevailing generally; affecting great numbers. An *Epidemic* is a disease which attacks numbers of persons in one place simultaneously or in succession, and which in addition is observed to travel from place to place, often in the direction of the most frequented lines of communication. Many epidemic diseases are also contagious, and all suggest the necessity of careful inquiry into the ventilation, drainage, food, drink, and habits of the persons liable to be affected. See HEALTH. EP′IDEM′ICALLY, ad. *-lĭ*. EPIDEMIOLOGY, n. *ĕp′ĭ-dĕm′ĭ-ŏl′ŏ-jĭ* [Gr. *logos*, discourse]: doctrine of epidemic diseases; method of investigating such diseases. EP′IDEM′IOLOG′ICAL, a. *-ō-lŏj′ĭ-kăl*, connected with or relating to, epidemic diseases. EPIDEMIOGRAPHY, n.

ĕp′ĭ-dĕm-ĭ-ŏg′ra-fĭ [Gr. *graphō*, I write]: treatise on epidemic diseases. *Note.—Epidemic diseases* are not permanent, are due to contagion and follow a track; whereas *endĕmic diseases* are connected with certain local conditions, and are more or less permanent in a district. See ENDEMIC; CONTAGION; INFECTION; FEVER; CHOLERA ETC.

EPIDEM′IC CER′EBRAL MENINGI′TIS: disease noticed and described by many American physicians since 1811, when Dr. North specially drew the attention of the profession to it. In 1838–40, it appeared in France, and committed great ravages in Versailles, where the mortality was 28 per cent.; in Strasburg, where the mortality was 42 per cent.; in Lyon, Nancy, and other garrison towns. The patients, in these cases, were almost entirely young conscripts; and the disease was regarded as non-infectious. In the spring of 1846, it appeared in the Dublin and Belfast workhouses, boys under 12 years of age being the only victims. In 1863, it was very fatal in the United States. In 1865, it ravaged West Prussia; of 2,000 cases recorded, half died; and of 347 cases, 330 were under 14 years of age. In the United States, two forms of the disease are recognized—one marked by shock, weak pulse, purpled limbs, and coma, death happening within the first day; the other presenting signs of cerebro-spinal mischief, such as tetanoid spasms; death here occurred in three days. Purple spots were present in 27 out of 44 cases.

A form of the disease is the *Black Death*, which, 1866, 7, caused intense alarm in Ireland. A healthy medical student, aged 19, residing in Dublin, fell ill with chilliness and *malaise*, 1866, Mar. 18, abt. noon. When he was visited in the evening, it was found that he had vomited frequently and was very prostrate; purple blotches appeared on his skin during the night, and about noon next day, he suddenly fell into stupor, and was dead at two, or about 26 hours from the apparent commencement of the symptoms. A girl, aged 18, presented similar symptoms Apr. 2, but recovered. Fatal cases were recorded May 12, 13, and 17. According to Dr. Mapother, 63 fatal cases had been registered (before July 1) in the Dublin district, exclusive of eight deaths among soldiers. The symptoms include two types of very different severity. In the graver, life is rapidly extinguished as if by a blood-poison; in the milder, the symptoms are those of inflammation of the cerebro-spinal axis, or its membranes. Dr. Stokes, however, regards these latter phenomena as secondary to the essential disease, and believes that they will always appear, if the patient lives long enough for their development. The earliest symptoms are chilliness and a sense of impending danger, and vomiting of a persistent character soon follows. There is constipation till shortly before death, when the evacuations are involuntarily discharged. The tongue is dry; the pulse abnormally compressible, and usually over 100. The

dark purple blotches, caused by the escape of dissolved hematinn (coloring matter of the blood) from the smaller vessels, are situated in and under the true skin of the legs, hands, face, back, and neck. These patches vary in size from that of a pin's head to that of a walnut, and are often sufficiently raised to be detected by the touch. The skin is dusky and moist, sometimes even bathed in sweat. In some cases, stupor, and in others, delirium and intense restlessness, are the forerunners of death. The rapidity with which this disease runs its course is appalling. A healthy boy, aged 10½ years, sank in less than five hours from the time of his seizure; and of 41 investigated fatal cases, 14 terminated within 24 hours. Of these cases, 21 were females, 20 males. Youth predisposes very strongly to the disease. No position in life affords exemption; one young nobleman, three medical students, two undergraduates, and several inhabitants of the lowest hovels—the seats of typhus and cholera—were among the victims.

With regard to treatment, almost every kind has been tried, and each has been found equally unavailing. The external application of cold to the spine and head, as advocated in various forms of disease by Dr. Chapman, deserves a trial. Dr. Mapother suggests that the disease is due, like scurvy, to the want of fresh vegetables as an article of food; and if this view is correct, this terrible malady is preventable. See MENINGITIS.

EPIDEM'IC MEN'TAL DISEAS'ES: morbid states of mind pervading a community. When we consider how ordinary and normal thoughts and emotions spread from one man to many, and sway multitudes to the same views and actions, we are not surprised at mental epidemics—such as, at times, spread from man to man, and involve whole nations. Such a disorder depends for its propagation, like physical epidemics, first on external circumstances, secondly, on the peculiar condition or constitution of the individuals affected. Like the bodily affection, the causes which provoke the insanity and the tendency to be affected may have been in process of development for years. Both attack the weak rather than the strong; both exist for a season, and disappear. In the case of the mental malady, the external influences—those which constitute the moral atmosphere—are ignorance, the power of one mind over another, the influence of language, the diffusion of particular opinions, the tendency to imitate. Probably, physical causes also are greatly efficient. It would be illogical to limit the production of the dancing mania (q.v.), which occasionally, during several centuries, swept over Europe, to the reaction succeeding the dread of the end of the world, which had previously prevailed epidemically. An examination of about a hundred manifestations such as that alluded to, collected from various sources, demonstrates that not merely the intoxication of joy, but the most absurd forms of belief—that dreams, delusions, superstitions, corruptions of language, all instincts and passions, even movements and

cries—may assume the form, and to a certain extent follow the laws of epidemic disease. From distant ages, there are records of a histrionic plague, when, after a summer of intense heat, multitudes conceived themselves players, and traversed the streets, and sank and died, repeating verses, and exhibiting extravagant gesticulations; of whole communities stricken with nightmare, which was so general as to be deemed contagious. There have been epidemics of homicidal and suicidal mania. In one age, hundreds were found possessed by Satan so far at least as their own belief and behavior went; in another, larger numbers supposing themselves changed into wolves; and in recent times, the leaping ague of Forfarshire, and outbursts of pyromania in various places, remind us of Bishop Butler's question: What is to prevent a whole nation becoming mad? The instances of epidemic mental disease recorded in the following table, have been selected from a vast number, with a view of showing not the frequency or extent of such affection, but the range of the phenomenon through the powers and propensities of our nature.

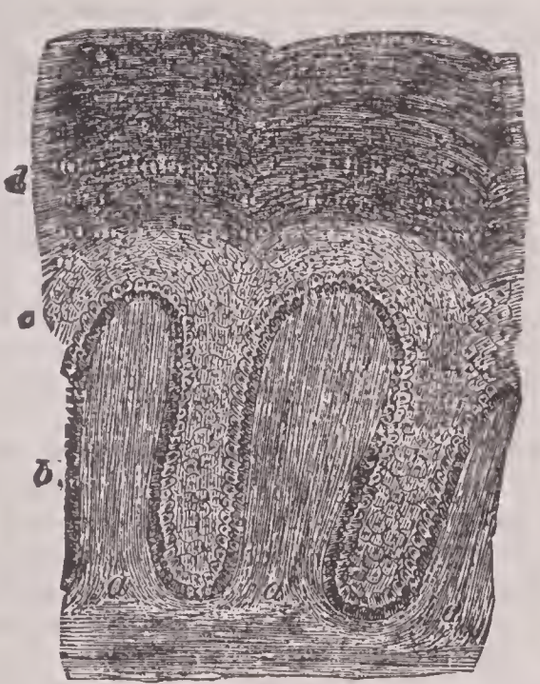
Popular Name.	Form of Disease.	Year.	Number Affected.	Authority.
St. Vitus's Dance.... St. John's Dance.....	Choreamania...	1374	Hundreds	Hecker
Wolf-madness.....	Lycanthropia...	1523	"	Calmiel
Possession	Demonomania..	1642, etc.	"	"
Convulsionaries of St. Medard.....	Theomania.....	1731	"	"
Incendiarism.....	Pyromania.....	1800	Many	Marc
Witchcraft.....	Demonopathia..	Various	Thousands	Various
Suicide.....	Melancholia.....	"	"	Esquirol
Visions.....	Delusions	"	Many	Brierede Boismont
Timoria, Panic.....	Panphobia.....	1845	Many	*Edin. Review* 1849

There appears to be no guarantee that the present and future generations shall be exempted from similar visitations, except in the general establishment of soundness of body and spirit.—Hecker's *Epidemics of the Middle Ages;* Calmiel, *De la Folie considerée sous le Point de Vue Pathologique, Philosophique, Historique et Judiciaire, depuis la Renaissancedes Sciences en Europe jusqu'au dixneuvième Siècle,* etc., and *Psychological Journal, passim.*

EPIDENDREÆ, n. *ĕp-ĭ-dĕn'drē-ē:* tribe of orchids. It comprises those genera which have the pollen masses waxy; a distinct candicle, but no separate stigmatic gland. EPIDENDRUM, n. *-drŭm* [Gr. *epidendrios,* on or in a tree—from *epi,* upon; *dendron,* a tree]: general term for an orchid of whatever genus growing on trees; an epiphytal orchid. *Epidendrum* is the name of a large genus of S. American orchids, family *Læliadæ,* and the typical genus of the tribe *Epidendreæ.* More than 300 species are known, most of them epiphytal on trees, but some terrestial. Many are beautiful, especially *E. nemorale. E. bifidum* is said to be purgative, anthelmintic, and diuretic. Two specimens are found in the United States: *E. conopseum,* on magnolia trees in S. C., Ga., and Fla.; and *E. venosum,* in Fla.

EPIDERMIC, a. *ĕp'ĭ-dĕr'mĭk* [Gr. *epi*, upon; *derma*, skin]: pertaining to the outer skin or cuticle; also EP'IDER'MAL, a. *-dĕr'măl*. EP'IDER'MIS, n. *-mĭs*, or EPIDERM, outer skin of the body; the cuticle; the outer coating of a plant or tree. In the body, it is a semi-transparent membrane, containing neither vessels nor nerves, and everywhere forming an external covering to the corium or true skin: see SKIN. The epidermis is called in ordinary language the *scarf-skin*. It consist of two layers, chemically and morphologically distinct—the *mucous layer*, which lies immediately upon the corium, and the *horny layer*, which forms the outermost surface of the body.

The *mucous layer* (known formerly as the *rete mucosum s. Malpighianum*) is of a whitish or slightly brown tint (in the negro, dark gray or black), and is composed of small soft cells. The innermost of these cells, resting on the



Perpendicular Section of the skin of the Leg of a Negro: Magnified 250 diameters.

a, *a*, papillæ of the cutis; *b*, deepest intensely colored layer of perpendicularly elongated cells of the mucous layer; *c*, upper stratum of the same layer; *d*, horny layer.

surface of the corium, are elongated and arranged perpendicularly; upon these follow elongated or roundish cells in many layers, which, in proportion to their distance from the corium, acquire, from their mutual pressure, a polygonal form.

All the cells in the mucous layer are nucleated vesicles distended with fluid, and likewise containing minute granules, which diminish in number in the more external cells.

The *horny layer*, the external semi-transparent part of the epidermis, in the white races is colorless; it is composed almost wholly of uniform cells, metamorphosed into plates or scales. The deepest plates in some degree resemble the uppermost cells of the mucous layer; but in the

second or third layer the flattening begins; till at length, after a gradual series of modifications, the hard, horny scales occur on the surface, where they are regularly cast off with more or less rapidity, and replaced by those beneath them. In reptiles and amphibians, this layer is periodically cast off in a more or less entire state, a new one being previously formed beneath it; and in man, desquamation in large patches often occurs after certain diseases, especially scarlatina.

The color of the epidermis differs in different persons and in different parts of the body. It is deepest around the nipple, especially in women during pregnancy and after they have borne children. A more or less dark pigment is often deposited, in persons who are exposed to the sun, in the face, neck, back of the hands, etc. These tints are not produced by special pigment-cells, but are seated in the common cells of the mucous layer, round whose nuclei granular pigment is deposited. In the negro and the other colored races, it is also only the epidermis which is colored, while the *corium* completely resembles that of European races. The perpendicular cells (see *b* in the figure) are the darkest, and form a shaply marked fringe at the edge of the clear corium. To these succeed brown cells, which accumulate in the depressions between the pupillæ, and the approach to the horny layer shows yellowish cells. The horny layer of the negro also inclines to a yellow or brownish tint. Morbid coloration of the epidermis (freckles, mother's marks, etc.) is produced in the same way as the color of the negro's skin.

The thickness of the epidermis varies extremely. While on the cheeks, brow, and eyelids, it varies from $\frac{1}{75}$ to $\frac{1}{50}$ of a line, on the palm of the hand it ranges from $\frac{1}{3}$ to $\frac{1}{2}$ a line and on the sole of the foot sometimes even exceeds a line. In some parts of the body the horny layer is thicker than the mucous; in others, the mucous is the thicker of the two. As the chief use of the epidermis is for protection to the soft and tender subjacent parts, it attains its greatest thickness on those portions of the body (palm of the hand and sole of the foot) most exposed to pressure and friction.

In *plants*, as in animals, the epidermis is formed of flattened cells, of which also new layers are continually produced from the bark below, while the outer ones dry up, lose their vitality, and peel off, crack and split off, or otherwise become separated from the living organism. The cells of the epidermis are often enlarged outward, so as to form projections, sometimes very slight, sometimes elongated into hairs (q.v.) Glands (q.v.) also are connected with the epidermis, sometimes by the intervention of hairs, sometimes without, and in this way it contributes to the secretion of substances formed in plants by the wonderful chemistry of nature, and on which their value to man often greatly depends. The cells of the epidermis are usually filled with a colorless fluid, but resinous and waxy substances are sometimes found in them, and sometimes silica

(as in grasses and *Equisetaceæ*), sometimes carbonate of lime (as in the *Charas*). The epidermis is pierced by *stomata* (q.v.). When the epidermis of plants is subjected to prolonged maceration, it can often be made to separate into two parts; one, more strictly called the epidermis, being the inner, lower, and thicker membrane; the other; the *Pellicie* or *Cuticle*, being very thin, and extending continuously over every part of the plant except where it is pierced by the stomata. Thus, this superficial pellicle invests even the finest hairs. In some of the *Algæ*, it seems to constitute the whole integument. In the greater number of plants, the epidermis is thin and soft, but sometimes it is thick, and sometimes hard.

EPIDOSYTE, n. *ĕp-ĭ-dō′sīt* [Gr. *epidosis*, a giving over and above; increase]: rock consisting, in 100 parts, of 61.33 epidote and 38.22 quartz. It is found in parts of Canada.

EPIDOTE, n. *ĕp′ĭ-dōt* [Gr. *epi*, upon; *didŏmai*, I give or add to; *didŏtai*, it gives or adds to]: mineral allied to garnet, composed of silica and alumina, with a considerable proportion of lime, or of peroxide of iron, or of peroxide of manganese. These diversities of composition constitute three distinct varieties; and of these there are subvarieties, differing in color and other particulars (*Pistacite, Bucklandite, Withamite, Zoisite*, etc.). E. is found sometimes massive, foliated, columnar, granular, or incrusting; often crystallized. Its crystals are prisms, variously modified. Its prevalent colors are green, yellow, and gray, but some varieties are red and black. It is found in gneiss, syenite, trap, and other rocks in many parts of the world.

EPIGÆA REPENS, *ĕp-ĭ-jē′a rĕp′ĕnz* (Trailing Arbutus, or Mayflower): one of the earliest spring flowers in the United States, belongs to the *Ericaceæ*, and is prized for its beauty and fragrance. It is indigenous to the n.e. states, along the Atlantic coast line, and the interior of Conn., Mich., Wis., Minn., and several of the s. states, where it is known as ground laurel; and medically is a strong diuretic. The pilgrim settlers found it abundant in the Plymouth woods, a welcome harbinger of spring before all the snow of their first dreary winter had gone.

EPIGÆOUS, a. *ĕp′ĭ-jē′ŭs* [Gr. *epi*, upon; *gē*, the earth]: in *bot.*, growing on land in contradistinction to growing in the water; growing close to the earth. E′pige′al, a. *-jē′ăl*, above ground.

EPIGEE, n. *ĕp′ĭ-jē* [Gr. *epi*, upon; *gē*, the earth]: the point of a planet's or satellite's orbit nearest to its primary: same as Perigee, which see.

EPIGENE, a. *ĕp′ĭ-jēn* [Gr. *epi*, upon; *gennaō*, I produce]: in *mineral.*, having undergone alteration in its chemical character while retaining the same crystalline form as before, foreign to the position which the crystals at present occupy; pseudomorphic.—In *geol.*, epigene signifies originating on the surface of the earth, as distinguished from hypogene rocks like granite, of which

Lyell's hypothesis is that it originated at a considerable depth below the surface.

EPIGENESIS, n. *ĕp′ĭ-jĕn′ĕ-sĭs* [Gr. *epi*, upon; *genĕsĭs*, generation]: formation upon, or in addition to, previously existing parts. The word is applied in physiology to that theory of new formations in organized beings which supposes them to spring from superadded centres of vital activity, as opposed to the theory which presumes that the new is formed by an evolution or development or modification of the old structure. See REPRODUCTION.

EPIGENOUS, a. *ĕ-pĭj′ĕn-ŭs* [Gr. *epigenēs*, in class. Gr. growing after or late, but here used for growing upon living bodies: *epi*, upon; *genos*, race, stock (?)]: in *bot.*, growing upon the surface of a plant, or part of it. Thus many fungi grow on the leaves of plants.

EPIGEOUS, or EPIGÆUS, n. *ĕp-ĭ-jē′ŭs* [Gr. *epigeios*, on or of the earth; *epi*, upon; *gē*, the earth]: in *bot.*, living close upon the earth.

EPIGLAUBITE, n. *ĕp-ĭ-glaw′bīt:* in *min.*, variety of metabrushite (q.v.).

EPIGLOTTIS, n. *ĕp′ĭ-glŏt′-tĭs* [Gr. *epi*, upon; *glottis*, the mouth of the windpipe—from *glotta*, the tongue]: the valve or cartilage that covers the upper part of the windpipe when food or drink is passing into the stomach: see LARYNX. EP′IGLOT′TIC, a. *-glŏt′tĭk*, pertaining to.

EPIGÆA REPENS, *ĕp-ĭ-jē′a rĕp′ĕnz* (TRAILING ARBUTUS, or MAYFLOWER): one of the earliest spring flowers in the United States, belongs to the *Ericaceæ*, and is prized for its beauty and fragrance. It is indigenous to the n.e. states, along the Atlantic coast line, and the interior of Conn., Mich., Wis., Minn., and several of the southern states, where it is known as ground laurel; and medically is a strong diuretic. The pilgrim settlers found it abundant in the Plymouth woods, a welcome harbinger of spring before all the snow of their first dreary winter had gone.

EPIGONATION, n. *ĕp-ĭ-go-nā′tĭ-ŏn* [Gr. *epigonatis* the kneepan, also a garment reaching to the knees;—from *epi*, upon; *gonatos*, the knee]: lozenge-shaped piece of some stiff material, which forms part of the dress of bishops in the Greek Church while officiating. It hangs from the girdle on the right side as low as the knee, and is supposed to represent the napkin with which our Lord girded himself at the Last Supper.

EPIGONE′ n. *ĕ-pĭg′ō-nē* [Gr. *epi*, upon; *gŏnē*, the seed, offspring]: in *bot.*, the cellular layer which covers the young seed-case in mosses, etc.

EPIGONI, n. plu. *ĕ-pĭg′ŏ-nī* [Gr. *epi*, upon; *gŏnē*, seed offspring]: those after-born; a mixed race; particularly applied to the children of the soldiers of Alexander the Great by Asiatic women.

EPIGRAM, n. *ĕp′ĭ-grăm* [F. *épigramme*—from L. *epĭ-*

gramma, an inscription—from Gr. *epi*, upon; *gramma*, a writing]: very short poem on one subject ending with a witty or ingenious turn of thought; the epigrams of the Greeks were simply inscriptions in verse on tombs, statues, and monuments, marked by great simplicity of style, but having little in common with what now passes under the name. The epigram first assumed a satirical character among the Romans. Catullus and Martial are reckoned the best Latin epigrammatists. In modern times, an epigram is understood to be a very short poem, usually two to eight lines, expressing an ingenious thought in pointed phraseology, reserving the essence of the wit to the close. The French excell all other nations in this kind of poetry. Their earliest epigrammatist of note was Clement Marot (1495–1544); their best are Boileau, Voltaire, and Piron. The epigrams of German writers are for the most part happily expressed moral proverbs, but the *Xenien* of Schiller and Goethe contain not a few sharp and biting satirical verses. In Britain, Pope, Burns, Byron, Moore, and other writers have shown remarkable power of epigrammatic satire. Ep′igrammat′ic, a *-măt′ĭk*, or Ep′igrammat′ical, a. *-ĭ-kăl*, like an epigram; concise; pointed (not necessarily always in verse). Ep′igram′matist, n. *-grăm′mă-tĭst*, a writer of epigrams. Ep′igrammat′ically, ad. *-lĭ*.

EPIGRAPH, n. *ĕp′ĭ-grăf* [F. *épigraphe*—from Gr. *epi*, upon; *graphō*, I write]: in *architecture*, a terse inscription on a monument or other building, to denote its use or appropriation—frequently wrought into the ornamental details of the structure. In *literature*, a citation from some author, or a sentence constructed for the purpose, placed as a motto at the beginning of a book, or of each chapter or part. Epigraphist, n. *ĕ-pĭg′ra-fĭst*, one who studies or is versed in epigraphy. Epig′raphy, n. *-fĭ*, study of inscriptions; that branch of science which deals with the deciphering and explanation of inscriptions.

EPIGYNOUS, a. *ĕ-pĭj′ĭ-nŭs* [Gr. *epi*, upon; *gunē*, a female]: in *bot.*, having the outer whorls of the flower adhering to the ovary so that their upper portions alone are free, thus appearing to be seated on it.

EPIHYAL, a. *ĕp-ĭ-hī′al* [Gr. *epi*, upon; Eng. *hyoid;* suff. *-ăl*]: pertaining or relating to the stylo-hyoid ligaments: N. constituting part of the lower or visceral arches, inclosing the nose, mouth and pharynx.

EPILEPSY, n. *ĕp′ĭ-lĕp′sĭ* [Gr. *epilēpsiă*, a seizure, the falling sickness—from *epi*, upon; *lambănein*, to take: F. *épilepsie:* L. *epilepsiă:* It. *epilessia*]: the falling sickness; a disease marked by irregularly recurring convulsive attacks. Ep′ilep′tic, a. *-tĭk*, affected with falling sickness: N. one affected with epilepsy. *Epilepsy* is a form of disease characterized by attacks of insensibility, with convulsive movements of the voluntary muscles, and occasionally arrest of the breathing. Epilepsy was called

by the ancient Greeks the 'sacred disease.' Owing to the mysterious and extraordinary character of the convulsion, it was always, in ancient times, supposed to be due specially to the influence of the gods, or of evil spirits; Hipporcates, however, combats this idea in a treatise, in which he maintains that epilepsy is no more and no less divine than all other diseases. Epilepsy is often called, in popular language, the 'falling sickness,' descriptive of one of its most striking phenomena, and pointing to the most obvious danger of the fit. The patient is seized, without reference to his condition or occupation at the moment, with insensibility, often so complete and sudden as to lead to serious accidents and bodily injuries; in the most aggravated cases, he has no premonitory sensations whatever, but falls down without any attempt to save himself, and usually with a wild inarticulate cry of some kind, immediately after which the face is violently distorted, the head drawn toward one or other shoulder, and the whole body convulsed. These convulsions follow in rapid succession for a few minutes, and are often attended by foaming at the mouth, and by great lividity, or, in some cases, livid pallor, which, with the irregular spasmodic movements of the lips, nostrils, and eyes, give a frightfully ghastly expression to the countenance, and almost invariably lead the bystanders to an exaggerated idea of the immediate danger of the fit. The immediate danger is, in reality, not great, excepting that the sudden attack may lead to an injurious or fatal fall; the tongue, however, may be bitten if protruded during the convulsion, or the patient may be so placed as to injure himself seriously by the repeated and unconscious movements of his body, or he may suffocate himself by accidently falling with his face in water, or otherwise closing up the mouth and nostrils, or by dragging upon a tightened neckcloth. Care should be always taken to avoid these accidents by keeping the epileptic as much as possible within view of persons acquainted with his condition, and able to assist him; as well as by warning the patient himself to avoid places of danger. Beyond the obvious precautions indicated above, there is almost nothing to be done for the patient; and an attempt to rouse him by violent stimuli, as ammonia applied to the nostrils, or by dashing water in the face, or, still more, by an internal administration, is likely to do more harm than good. The tongue should be looked to, a piece of cork or other gag being, if necessary, inserted between the teeth; the patient should then be placed on a mattress or other soft place near the ground; his neckcloth should be removed, and the dress loosened round the chest; the head should be, if possible, a little raised, and a free circulation of air maintained (this last precaution being apt to be neglected in a crowd). The ordinary course of the fit (which usually lasts five to twenty minutes altogether) is as follows: the convulsions gradually diminish in intensity, and the patient passes into a state of deep but motionless stupor, with dilated

pupils, and sometimes, but not always, with snoring or noisy breathing; the foaming at the mouth ceases, the color gradually returns, and this state leads to recovery through a more or less protracted, but apparently natural sleep, the patient, on awaking, being often quite unconscious that he has been the subject of any anxiety, or, indeed, in any unusual condition whatever. Although in all cases of true epilepsy there is a stage of complete coma (q.v.), or unconsciousness, yet the fit is often very transcient, and but little attended by convulsion, being also less sudden than above described, and not necessarily causing a fall to the ground. The French language, popular and scientific, has adopted the terms of *grand mal* and *petit mal* (i.e., great and little evil), as characterizing the more and less dangerous forms of epilepsy respectively. In some cases fits of greater intensity are preceded by certain premonitory symptoms or peculiar sensations, which act as warnings to the patient himself. These sensations which precede the fit have been termed in Latin the *aura* (i.e., breath) *epileptica*, from their supposed resemblance to a current of cold air passing over the body, and proceeding from the extremities toward the head. This description does not however, hold good in all cases; and frequently there is no *aura*, or unusual sensation of any kind, preceding. Some of the most ancient authorities assert strongly the power of a tight bandage, placed suddenly upon the limb in which the *aura* begins, to cut short, or even to prevent, the fit; and this alleged fact has never been altogether discredited, and has of late years been brought into renewed notice by good observers. It is even maintained by some that such a bandage, placed experimentally upon one or other of the limbs, and tightened on the approach of a fit, has been found effective in some cases in which there is no distinctly local sensation; and epileptics have been repeatedly convinced of the propriety of habitually wearing a bandage loosely applied upon the arm, which they have been able, by carefully watching their own sensations, and by being watched by others, to get tightened at the proper time. If this view be fallacious, there is at least no risking in acting on it.

But the fit and its treatment form only a part of the anxieties which arise out of a case of epilepsy. The ultimate danger of the disease has little relation to the severity of the individual fits; the frequency of the attacks being apparently much more apt than their character to influence the duration of life. Indeed, though epileptics may survive several severe paroxysms at distant intervals, and recover in the end with an apparently unbroken constitution, it rarely happens that very frequently repeated attacks, even of the *petit mal*, are unattended by some permanent depreciation of the powers of mind or of body. The most frequent, perhaps, of the serious consequences is insanity (q.v.), sometimes assuming the form of acute mania or monomania following the attacks, but quite as frequently

tending to gradual imbecility without any acute seizure. Sometimes the development of the epileptic insanity, or dementia, is attended by palsy, and other indications of structural disorder of the brain; in other instances, no such consequences occur, and the brain after death may be found to have very little tangible disease. Very often, even when the mind remains tolerable entire, there is loss of memory, and a certain want of acuteness and depression of spirits, which unfit the individual for the regular business of life. Disorders of the digestion are also not uncommon; and there is frequently a want of tone and vigor in all the bodily functions, inducing langour and reserve.

The causes and radical cure of epilepsy are almost equally involved in mystery. The convulsive attack has been supposed by some to be dependent on an increased afflux of blood to the brain; by others it has been attributed, with about equal reason, to precisely the opposite condition. Certain cases undoubtedly depend upon organic disease, as tumors or injuries to the brain and its membranes, more especially near the surface. Local sources of irritation in other parts of the body also have been supposed to be exciting causes; and cases have keen recorded in which the disease has been cured by the amputation of a finger or the division of a nerve, and others, especially in children, in which the condition of astigmatism and other errors of refraction by proper spectacles has been followed by permanent cessation of the convulsive attacks. It seems probable that chronic poisoning of the system by waste products found within the body (autointoxication) may be a cause of the disease, or at least may aggravate the already existing condition.

The condition of the epileptic seems favorably affected by everything that conduces to a quiet and hopeful state of mind, and to vigor of body. The treatment should therefore in general be of the kind termed *tonic* (q.v.), and should be adapted with care, and after very minute inquiry, to the removal of all special bad habits, and occasional causes of depression of the system. The influence of a happy and quiet life, without unhealthful excitement, and with proper occupations, varied by amusement and exercise in the open air, will tend to prevention of attacks. The colony plan of treatments offers much encouragement in the way of reducing the number of the attacks. The marriage of epileptics has been known in some cases to increase the disease, and to involve its transmission to a considerable number of children. The epileptic tendency may often be successfully treated by systematic and exclusive vegetable diet, or by large reduction of the proportion of animal food. The good effects observed to follow an exclusion of meat in whole or in part from the diet is offered in support of the belief that the disease is caused or aggravated by autointoxication. Among the innumerable remedies recommended by authorities, the bromides and the salts of iron and zinc have perhaps

the largest amount of experience in their favor; and the appreciation of counter-irritants (q.v.) to the nape of the neck, or between the shoulders, has often been followed by prolongation of the intervals, or decerase in the severity of the fits. Almost all the accredited remedies, however, have been observed to produce a temporary relief of this kind, even when without any permanent influence on the course of the disease.

Some of the *Lower Animals* are subject to epileptic fits. The disease is common in cats, dogs, and highly bred pigs. The creatures writhe with involuntary spasms, and are for the time without sight or hearing. Sometimes the muscles of the throat are so involved that fatal suffocation occurs. The attack is generally preceded by dullness, and lasts 10 to 30 minutes. It is generally traceable to torpidity or irregularity of the bowels, worms, debility, or plethora. In dogs, it is a frequent sequel of distemper. In cattle, it occurs usually in connection with the engorgement of the first or third stomachs; they throw themselves violently about, bellowing loudly, but seldom die. It is rare in horses, and differs from megrims, for which it is often mistaken, but in which there are no spasms. The treatment consists in freely opening the bowels, removing worms, if any are present, resorting to bleeding and spare diet, if the animal's condition is high, and generous feeding and tonics if it is low. The best preventives are carefully regulated diet, an occasional laxative, with a course of tonics, especially of arsenic.

EPILEPTIC COLONIES: the treatment and care of epileptics in special institutions may be said to be one of the developments of applied philanthropy of distinctly recent origin.

The first distinct attempt to provide for epileptics was inaugurated by a Lutheran pastor, Friedrich von Bodelschwingh, who in 1887 founded at Bielefeld in Westphalia, Germany, the Bethel Colony, which, from small beginnings, has grown up to a villlage inhabited solely by epileptics. Here everything has been provided to meet their special needs, to make up for their deprivations in the outside world. They are supplied with schools to improve their minds, industrial teachers to make them more or less self-supporting, and physicians to study and treat their cases. Outdoor occupations are provided, special diet is arranged for, recreations, amusements, religious instruction, in fact all of the devices that go to make up a home, have been provided under this man's guidance, so that in 1903 at least 4,000 people, not less than half of whom are epileptics, are being taken care of in Bethel.

The success of the Bielefeld Colony prompted movements elsewhere. Other colonies were founded in Germany and other European countries. Ohio established the first institution for epileptics in the United States, although this was built on the hospital rather than the colony plan. New York has Craig Colony at Sonyea, one of the most

elaborate and beautiful institutions of this class, closely modeled on the Bielefeld plan, and containing a population of over 1,000. Massachusetts has a colony at Palmer; Pennsylvania a colony farm at Oakburn; and there is a New Jersey State village for epileptics at Skillman. A colony for epileptics was begun in 1902 at Abilene, Texas, and there are movements on foot for similar establishments in Connecticut, Indiana, Illinois, Kansas, North Carolina, Missouri, Minnesota, and California. In England the first colony founded was at Chalfont in 1893 and another at Warford in 1900. There is also a colony, the Waghull Home near Livepool; another at Godalming; a large colony at Chelford, and one for the city of London, not far from Croydon. Other colonies have been founded in Brazil, Belgium, Switzerland, Sweden, Russia, Italy, Turkey, India, Japan and Australia.

Consult: Letchworth, *Care and Treatment of Epileptics* (1900).

EPILOBIUM, *ĕp-ĭ-lō′bĭ-ŭm:* genus of plants of the nat. ord. *Onagraceæ*, having four deciduous calycine segments; four petals; a much elongated, 4-sided, 4-celled, 4-valved, many-seeded capsule; and seeds tufted with hairs at one end. The species are herbaceous perennials, natives of temperate and cold countries, and very widely diffused both in the n. and in the s. hemisphere. Some are very ornamental from the beauty of their flowers. Most of the Amer. species have small flowers, and some of them are very common in moist places. *E. angustifolium*, which has the petals dissimilar in shape and size, is frequently planted in gardens and shrubberies for its numerous and beautiful rose-colored flowers; but its creeping roots are apt to overrun a flower garden. It is sometimes called French Willow, from the resemblance of its stems and leaves to some kinds of willow, and the name Willow-herb is often extended to the whole genus. It is found in far northern regions, and its leaves and young shoots are sometimes a grateful addition to the meals of the arctic traveller. The pith, when dried, yields a quantity of sugar to boiling water, and is used in Kamtchatka for making a kind of ale, from which also vinegar is made.

EPILOGUE, n. *ĕp′ĭ-lŏg*, [F. *épilogue*—from L. *epĭlŏgus*; Gr. *epĭlŏgos*, a close or conclusion]: in *oratory*, the summing up or conclusion of a discourse. In connection with the drama, a short speech in prose or verse which frequently, in former times, was subjoined to plays, especially to comedies. The epilogue was always merry and familiar in its tone, and was intended to establish a kindly understanding between the actor and the audience, as well as to conciliate the latter for the faults of the play, if there were any, and to send them away in good-humor. One of the neatest and prettiest epilogues ever written, a complete model of what an epilogue should be, is that spoken by Rosalind at the conclusion of Shakespeare's *As You Like It.* Epilogistic, a. *ĕp′ĭ-lō-jĭs′tĭk*, of or like epilogue.

EPIMACHUS, *ē-pĭm′a-kŭs:* genus of birds, natives of Australia and Papua, often improperly classified with birds of paradise. The *E. albres* of Australia, is of violet-black color, with green-tipped feathers around the neck, and long, white, silky plumes growing from back and rump. The *E. magnus,* of Papua, is of black brown color, and has a body 12 inches long and a tail 3 ft. long, and a head and belly of beautiful blue.

EPIMEDIUM, n. *ĕp-ĭ-mē′dĭ-ŭm* [L. *epimedion,* a plant, by some supposed to be *Marsilea quadrifolia:* Gr. *epimēdion,* barrenwort]: in *bot.,* barrenwort; genus of berberids, tribe *Nandineæ. E. alpinum* (Alpine Barrenwort) is found in rock-works, old castle gardens, etc.

EPIMENIDES, *ĕp-ĭ-mĕn′ĭ-dēz:* Greek poet and priest at Crassus; b. probably at Phæstus in Crete, B.C. 6th or 7th c. His history has reached us in only mythical form. He is said to have fallen asleep in a cave when a boy, and not to have wakened for 57 years. Like Rip Van Winkle, he was naturally much astonished and perplexed on his return to broad daylight. His period of slumber, however, had not passed away unprofitably. His soul, disengaging itself from its fleshly prison, betook itself in the interval to the study of medicine and natural philosophy; and when it had taken on again its mortal coil, Epimenides found himself a man of great knowledge and wisdom. Goethe has written a poem on the subject, *Des Epimenides Erwachen.* Epimenides went to Athens about B.C. 596, where, by the performance of various mystical rites and sacrifices, he was said to have stayed a plague with which the inhabitants were afflicted. When he died is not known, but we may be certain that he did not live (as is fabled) 299 years. That he wrote the epic poems attributed to him, the longest of which was on the Argonautic expedition, is highly improbable. Compare Heinrich, *Epimenides aus Kreta* (1801).

EPIMERAL, n. *ĕp′ĭ-mē′răl* [Gr. *epi,* upon; *mērŏs,* the upper part of the thigh]: that part of the segment of an articulate animal which lies immediately above the joint of the limb. EPIMERA, n. plu. *ĕ-pĭm′ĕ-ră,* the parts lying immediately above the joint of the limb, as the *epimera* or side segments of the lobster.

EPIMETHEUS, *ĕp-ĭ-mē′thūs*: in Greek mythology, a son of Iapetus and Clymene, and the brother of Prometheus. Against the latter's advice he married Pandora, who opened the box in which the foresight of Prometheus had hid all the ills by which mortals were liable to be afflicted. All kinds of diseases and torments issued out of the box, and hope alone remained behind. According to other accounts it was Epimetheus himself who opened the box. It is to be remarked that, in the Greek tradition. curiosity and disobedience are made the origin of evil, as in the Mosaic account of the fall.

EPINAL, *ā-pē-nâl′:* town of France, dept. of Vosges, in a delightful district at the w. base of the Vosges Mountains.

on both banks of the Moselle, about 200 m. e.s.e. of Paris; lat. 48° 10′ n., long. 6° 26′ e. It is a well-built, handsome town, with clean, regular, though badly paved streets, and is surmounted by the ruins of an old castle, the gardens attached to which are much admired. Among its chief buildings are the parish church, an antique Gothic structure; the hospital formerly a Capuchin convent; a museum of pictures, antiquities, and natural history; the barracks; and the residence of the prefect of the department. Epinal manufactures chemical products, lace, block-tin, wrought-iron, pottery, cutlery, paper, and leather, and has some trade in grain, wine, timber, etc. Pop. 23,223.

ÉPINAY, *ā-pe-nā′*, Louise Florence Pétronille de la Live d': French writer: 1725-83. At the age of 19, she married her cousin, M. d'Epinay, but the union was not happy. While her husband was abandoning himself to dissolute courses, she sought the intercourse of philosophers and men of genius. In 1745 she formed a close intimacy with Rousseau, and presented him with a small house (the now famous Hermitage) on one of her husband's estates in the woods of Montmorency. An unfortunate jealousy, however, which Rousseau conceived for Grimm, another friend of Madame d'Epinay, was followed by an open rupture with his benefactress, and in his *Confessions* he scrupled not to malign her by way of vengeance. She spent the remaining 25 years of her life in comparative solitude, seeing only a small and select circle of philosophers and littérateurs. When Grimm was obliged to leave Paris, she continued, under the direction of Diderot, his literary correspondence with northern sovereigns. From the pen of Madame d'Epinay we have *Conversations d'Emilie* (Paris 1774), a work on education pronounced by the French Acad. to be the most useful published for a number of years; *Mémoires et Correspondance de Madame d'Epinay, renfermant un Grand Nombre de Lettres inédites de Grimm, de Diderot, et de J. J. Rousseau, etc.* (Paris 1818); *Les Confessions du Comte de * * **; etc.

EPINEPHELE, n. *ĕp-ĭ-nĕf′ĕ-lē* [Gr. *epinephelos*, clouded; *epi*, upon; *nephelē*, a cloud]: in *entom.*, genus of butterflies, family *Satyridæ*. *Epinephele Janira* is the Meadow Brown. It is smoky-brown with a white-pupilled black spot on the upper side of the forewings; Europe. N. America has a number of nearly related species, of the genera *Satyrus, Debis, Neonympha,* and *Apatura,* mostly meadow species, some woodland. The caterpillar of *Janira* is said to feed on grasses in the autumn and spring; the perfect insect is seen during hay harvest.

EPIOTIC, a. *ĕp-ĭ-ŏt′ĭk* [Gr. *epi*, upon; *ōtos*, the ear]: in *anat.*, name given by Prof. Huxley to the upper bone of the auditory capsule, part of the pars petrosa in man. It is the ossific centre corresponding to the lower part of the mastoid bone. It surrounds the posterior semi-circular canal, and extends into the mastoid portion.

EPIPACTIS, n. *ĕp-ĭ-păk′tĭs:* a genus of orchids.

EPIPEDOMETRY, n. *ĕp-ĭ-pĕ-dŏm′ĕ-trĭ* [Gr. *epipedos*, on the ground, on the ground floor, level, flat; *epi*, upon; *pedon*, the ground; *metron*, a measure]: in *geom.*, the measurement of figures standing on the same base.

EPIPERIPH′ERAL: see ENTOPERIPHERAL.

EPIPETALOUS, a. *ĕp′ĭ-pĕt′ă-lŭs* [Gr. *epi*, and *petalon*, a petal]: inserted upon the petals.

EPIPH′ANITE: see EUKAMPTITE.

EPIPHANIUS, *ĕp-ĭ-fā′nĭ-ŭs*, SAINT: Christian bishop, and writer of the 4th c.; b. of Jewish parents in Palestine; d. 403. He was baptized in his 16th year, and was educated among the Egyptian monks, who inspired him with an aversion to all liberal science. He rose gradually to the rank of Bp. of Constantia (formerly Salamis) in Cyprus, and continued in that office from 367 till his death. His polemical zeal was conspicuously manifested against Origen. In his writings he had proclaimed him a heretic; and in 394 he went to Palestine, the focus of Origen's adherents, and called upon John, Bp. of Jerusalem, and the two monks, Rufinus and Jerome, to condemn him. A more legitimate object of his violent opposition was the increasing worship of images. Jerome relates how he indignantly tore down an image in the precincts of a church in Palestine, as being contrary to the divine law. Among his writings, collected by Petavius (2 vols. Paris 1622), the most important is his *Panarion*, or catalogue of all heresies (80 in number), a work which strikingly shows his unfitness for a historian. His credulity and want of honesty are excessive.

EPIPHANY, n. *ĕ-pĭf′ă-nĭ* [Gr. *epiphaneiă*, appearance —from *epi*, upon; *phainō*, I bring to light, I appear: F. *épiphanie*, epiphany—from L. *epiphănĭă*, manifestation]: among the heathen Greeks, a festival in commemoration of the appearance of a god in any particular place. The word subsequently passed into the usage of the Christian Church to denote in general the manifestation of Christ to the world, and was applied in the Eastern Church to a festival opening the Christian year and celebrating the manifestation or appearance of Christ upon the earth, with special reference first to His baptism, at which time He was proclaimed from the heavens as the glorious and eternal Son of God, and so was manifested on earth. His birth was viewed as merely a preliminary to his baptism, and both were celebrated together, Jan. 6.—the two festivals of Christmas and E. not being separated till toward the end of the 4th c. Indeed, in the Eastern Church, E. became a favorite term for Christian baptism. The festival, passing to the Western Church (recorded first in 360), was changed as to its basis, and referred to the manifestation of Christ to the Gentiles on the day when he was seen and worshipped by the three wise men who came from the East: see MAGI. It also ceased to be used to denote baptism. This occasion is still commemorated in large portions of the church on Jan. 6, the 12th day after Christmas; hence the E. is called

also Twelfth Day. The E. is observed as a 'scarlet day' at Oxford and Cambridge universities.

EPIPHENOMENON, *ep'i-fe-nom'e-non* [Gr. *epi*, upon, and *phenomenon*, appearance]: in psychology and philosophy, refers to a theory as to the function and importance of consciousness in the universe. In common with some other theories, epiphenominalism assumes that conscious activities are invariably connected with material processes,—physical stimulations and nervous impulses. It is different from other theories in the assumption that the conscious events are always a result and never a cause or condition of the material events. Consciousness is thus a mere secondary incidental by-product without any service or utility in the world. This view is contrary to the doctrine of utility in modern evolutionary theories, and as a consequence it is not generally accepted at the present time.

EPIPHONEM, n. *ĕ-pĭf'o-nēm*, or EPIPHONE'MA, n. *-nē'ma* [Gr. *epiphonē'ma*, a thing uttered; *epiphōnĕō*, I utter; *phōneō*, I speak or utter]: in *rhet.*, exclamatory sentence orstriking reflection which sums up or concludes a discourse.

EPIPHORA, n. *ĕ-pĭf'ō-ră* [Gr. *epĭphŏră*, a bringing to or upon—from *epi*, upon; *phĕrō*, I bring]: watery eye, a disease in which the tears flow over the cheek in consequence of over-production or of an obstruction in the canal which should carry them off; violent determinations of the fluids to any part of the body, produced in general by inflammation.

EPIPHYLLOUS, a. *ĕp'ĭ-fĭl'lŭs* [Gr. *epi*, *phullon*, a leaf]: inserted on a leaf, or growing upon it. EPIPHYLLUM, n. *ĕp'ĭ-fĭl'lŭm*, one of the cactus family; a genus of plants whose stems consist of fleshy lobes or leaf-like expansions; splendid flowering plants, so called in allusion to the flowers growing on the flat branches, which appear like leaves. EPIPHYLLOSPER'MOUS, a. [Gr. *epi*, *phullon*, *sperma*, a seed]: having the seeds on the back of the frond or leaf. Plants of this character are now called dorsiferous ferns.

EPIPHYTE, n. *ĕp'ĭ-fīt* [Gr. *phŭtŏn*, a plant—from *epi*, upon; *phŭō*, I grow]: plant not rooted in the ground, but growing on another, but which does not, like a parasite, derive its nourishment from the other; plant attached to another plant, and growing suspended in the air; popularly, but less correctly, called AIR-PLANT. They are found attached to trees, from the decaying portions of the bark of which, or of mosses and lichens which grow upon it, they derive their nutriment, probably, also drawing it from the air to a larger extent than other plants do. Mosses and lichens themselves, growing upon trees, may be called epiphytes, but the term is generally used of phanerogamous plants. Epiphytes are not connected with the trees on which they grow in the peculiar manner of the misletoe, *Balanophora*, and other true parasites—not sending roots

like them into the wood to suck the juice of the tree. It is chiefly in warm and moist climates that phanerogamous epiphytes are found. Most of them prefer shady situations. Within the tropics, they often form an interesting and remarkable feature of the vegetation. Some of the *Bromeliaceæ* (as *Tillandsia*), *Cactaceæ*, *Araceæ*, *Geseraceæ*, and other nat. orders are epiphytes; but the order to which they belong more than to any other is *Orchidaceæ*. Many of the epiphytous orchids, as well as other epiphytes, are remarkable for their beauty; and the attention which has recently been given to their cultivation in hot-houses has been rewarded by perfect success. See ORCHIDS. Plants which usually occur as epiphytes are sometimes found growing on rocks also. Although seldom found except in moist climates, epiphytes are generally capable of enduring considerable drought, parting slowly with the moisture which they have imbibed. EP′IPHYTES, n. plu. *-fītz*, or EPIPHYTA, n. plu. *ĕ-pĭf-ĭ-tă*. EP′IPHYT′IC, a. *-fĭt′ĭk*, or EP′IPHYT′ICAL, a. *-ĭ-kăl*, and EP′IPHYTAL, a. *-fī′tăl*, pertaining to; growing upon another plant.

EPIPLEROSIS, n. *ĕp-ĭ-plē-rō′sĭs* [Gr. *epiplērōsis; epi, plērōsis*, repletion]: in *med.*, over-repletion; excessive fulness or distention, as of the arteries with blood.

EPIPLEXIS, n. *ĕp-ĭ-plĕks′ĭs* [Gr. *epiplexis*—from *epi′-plēssō*, I chastise, I rebuke; *epi*, upon; *plēssō*, I strike]: in *rhet.*, figure by which a speaker seeks to convince and move by gentle upbraiding.

EPIPLOCE, n. *ĕ-pĭp′lo-sĕ*, or EPIP′LOCY, n. *-sĭ* [Gr. *epiplokē*, a plaiting together—from *epiplekō*, I plait together; *epi*, upon; *plekō*, I plait, I fold]: in *rhet.*, figure by which one aggravation, or striking circumstance, is added in due gradation to another; as, He not only spared his enemies, but continued them in employment; not only continued them in employment, but advanced them.

EPIPLOON, n. *ĕ-pĭp′lō-ŏn* [Gr. *epiplŏŏn*, the caul—from *epi*, upon; *plein*, to sail, to swim]: the caul—a portion of the peritoneum of lining membrane of the abdomen, which covers in front, and as it were floats on, the intestines. EPIPLOIC, a. *ĕp′ĭ-plō′ĭk*, pertaining to the epiploon or caul.

EPIPODIA, n. plu. *ĕp′ĭ-pō′dĭ-ă* [Gr. *epi*, upon; *poda*, a foot]: the muscular lobes developed from the lateral and upper surfaces of the foot of some mollusks. EPIPODITE, n. *ĕ-pĭp′ō-dīt*, a process developed upon the basal joint of some of the limbs of certain crustacea. EPIPODIUM, n. *ĕp′ĭ-pō-dĭ-ŭm*, a disk formed of several knobs or glands.

EPIPOGIUM, n. *ĕp-ĭ-pō′jĭ-ŭm* [Gr. *epi*, upon; *pōgōn*, the beard, from the lip being uppermost]: in *bot.*, genus of orchids.

EPIPOLISM, n. *ĕ-pĭp′o-lĭzm* [Gr. *epipolē*, a surface]: same as FLUORESCENCE: see FLUOR. EPIP′OLIZE, v. *-līz*, to affect or modify by the phenomena of epipolism; to change into an epipolic condition.

EPIPTEROUS, a. *ĕ-pĭp'tĕr-ŭs* [Gr. *epi*, upon; *pteron*, a feather, a wing]: in *bot.*, having a wing at the top.

EPIRRHEOLOGY, n. *ĕ-pĭr'ĭ-ŏl'ŏ-jĭ* [Gr. *epirrhŏē*, a flowing on; *logos*, discourse]: that branch of natural science which treats of the effects of external agents on living plants.

EPIRUS, *ĕ-pī'rŭs*: ancient name of a part of Greece, bounded e. by the chain of Pindus, s. by the Ambracian Gulf, w. by the Ionian Sea, and n. by Illyria and Macedonia. It formed the s. part of modern Albania, or the pasheaic of Janina, a wild and mountainous region, haunt of robbers and semi-civilized tribes in all ages. The chief town was Dodona (q.v.); the chief rivers, the Acheron, Cocytus, Arachthus, and Charadrus. Anciently, it was celebrated for its cattle and its breed of Molossian dogs. Its earliest inhabitants were probably Pelasgians. In the historic period, Theopompus speaks of 14 tribes, most of whom were believed by the Greeks themselves to be not of Hellenic origin. The principal were the Chaones, Thesprototi, and Molossi, the last of whom finally obtained the entire sovereignty of the country. Of the Molossian kings of E. the most distinguished was Pyrrhus, who long waged successful war against the Romans. But after this race of kings became extinct (B C. 230–229) by the death of Ptolemy, grandson of Pyrrhus, a republican constitution was adopted, whereupon parties sprang up among them, and the neighboring Macedonians got the upper had. On the conquest of Macedonia by the Romans (168 B.C.), the Epirots were accused of having assisted Perseus, the Macedonian king, and the most revengeful measures were put in force against them. Æmilius Paulus, the Roman general, plundered and razed to the ground the 70 towns of E.. and sold into slavery 150,000 of the inhabitants. From this period, E. shared the vicissitudes of the Roman and Byzantine empires, until 1204, when one of the Comneni made himself independent. His dynasty ruled the country until 1466, when it was finally conquered by the Turks (see SCANDERBEG). E. peopled largely since the 14th c. by Albanians (see ALBANIA), formed latterly a part of the Turkish vilayet of Janina. The Berlin Congress, 1878, recommended that the s. part of E. should be ceded to Greece; and through the mediation of the Six Western Powers, the district e. of the river Arta was ceded to Greece 1881.

EPISCENIUM, n. *ĕp-ĭ-sēn'ĭ-ŭm* [Gr. *episkēnion*—from *epi*, upon, over; *skēnē*, the scenes]: in *Gr. arch.*, a division of the scene of a Greek theatre: it sometimes consisted of three divisions made by ranges of columns one above the other; the lower was termed scena, and the others *episcenia*.

EPISCOPACY, n. *ĕ-pĭs'kŏ-pă-sĭ* [Gr. *episkŏpĕō*, I oversee: mid. L. *epĭscŏpŭs*, an overseer—from Gr. *epi*, upon; *skŏpĕō*, I see]: church government by bishops; the order of bishops in the English and other churches. EPIS'COPAL, a. *-păl* [F.—L.]: pertaining to Episcopacy. EPIS'COPA'LIAN, n. *-pā-lĭ-ăn*, an adherent or member of the Chh. of Eng., or of a church governed by bishops. ADJ. pertaining to. EPIS'COPALLY, ad. *-lĭ*. EPIS'COPA'LIANISM, n. *-lĭ-ăn-ĭzm*, the system of episcopal church government. EPIS'COPATE, n. *-pāt*, the order of bishops; office and dignity of a bishop.

EPISCOPACY form of church government in which one order of the clergy is superior to others; viz. bishops (prelates) to ordinary pastors or presbyters (priests). It is called sometimes *diocesan episcopacy*, in distinction from that episcopacy which Congregationalists and Presbyterians also assert—the oversight of a local church or congregation by its pastor: see BISHOP. It is not essential to E. that there should be *archbishops*, exalted in rank or authority over other bishops. E. has actually subsisted under very various modifications; the power of bishops being more or less in extent, more or less controlled by synods of presbyters, or even—in the Prot. Episc. Church in the U. S.—by a diocesan convention of presbyters and lay delegates. The power of the bishop also is variously affected by the relations between church and state; and great differences in this respect exist between the Church of England, the Church of Sweden, and the Church of Denmark, all Episcopalian, and all connected with the state as *established* churches. See ANGLO-CATHOLIC CHURCH: CHURCH OF ENGLAND: EPISCOPAL CHURCH, PROTESTANT: ROMAN CATHOLIC CHURCH: GREEK CHURCH: ETC.

There is now, among biblical scholars, general agreement that the Greek words for 'bishop' and 'presbyter' in the New Testament are applied to the same church officer: the former describing his work as a superintendent; the latter, a title of reverence. Thus, the apostle Paul calls the 'presbyters' of the Ephesian Church 'bishops of the flock;' and the apostle Peter, styling himself a 'presbyter,' addresses his brother 'presbyters' as holding the office of 'bishop.' In each single church also, so far as appears, there was, as originally organized, a plurality of 'bishops.' Presbyterian and Congregational churches call their pastors or ministers 'elders' (that is presbyters) and 'bishops,' and regard them as constituting the one order in the ministry. Refusing a diocesan, they hold to a parochial episcopate; and are not known in popular language as holding to episcopacy.

The Roman Catholic Church teaches that its hierarchy of bishops, priests, and deacons, has been instituted by divine ordinance; that the bishops are the immediate successors of the apostles; that ordination confers a special grace; and that the pope or bishop of Rome, as the immediate successor of Peter and the vicar of Christ, is the head of the episcopate throughout the world, and has authority over the universal church.—The Greek or Eastern Church (like the Roman) teaches the divine origin of episcopacy, apostolic

succession, and the conveying of grace in ordination by the imposition of hands: but calls the pope of Rome a usurper; and does not acknowledge the supreme authority of any earthly head over the bishops and the church.—The Jansenists of Holland, and the Old Catholics maintain the divine authority of episcopacy, but do not acknowledge allegiance to the pope. Their own episcopal orders were obtained through Rom Cath hands.—In the Church of England and the Prot. Episc. Church of the U. S. two grades of opinion are held: 1. The Anglo-Catholic or 'high church' view declares that episcopacy is necessary to the *existence* of the church; that grace is imparted in ordination through the imposition of hands; and that the apostolic succession has been maintained. 2. The 'low,' or 'broad church' view teaches that episcopacy is necessary for the *well*-being of the church, but not to its existence; and that the episcopate was gradually and wisely formed out of the presbytery. This view was prevalent among the Protestants at the Reformation. Few then among English clergymen maintained the divine right of episcopacy. The most eminent of them acknowledged the validity of presbyterian orders; some of them had themselves been thus ordained. Many in the English Church hold this opinion still. Dean Stanley says, 'According to the strict rule of the church, derived from these early times, there are only two orders —presbyters and deacons.' Bishop Lightfoot says, 'At the close of the apostolic age, the two lower orders of the three-fold ministry were firmly and widely established; but traces of the episcopate, properly so called, are few and indistinct.' . . . 'The episcopate was formed out of the presbyterial order by elevation; and the title, which originally was common to all, came at length to be appropriated to the chief of them.'—The Moravian Church has episcopal ordination, derived, 400 years ago, from a regularly ordained Waldensian bishop; but it acknowledges the ordination of other Christian churches, and freely receives ministers coming from them.—The Lutheran Church of Germany has only one order of ministers, with an officer called a superintendent. In Sweden the Lutherans have bishops (the validity of whose ordination is not clearly established), but maintain the equality of the ministry. In Denmark the bishops do not claim an unbroken apostolic succession.—The Reformed Episcopal Church 'adheres to episcopacy, not as of divine right, but as a very ancient and desirable form of church polity.' It derives its orders from Bishop Cummins, who had been consecrated in the Prot. Episc. Church.—The episcopacy of the Methodist Church in America avowedly rests on a presbyterial foundation; the first bishop having been ordained by John Wesley, who was a presbyter in the Church of England, and regarded the office which he thus originated as one of expediency and of superintendence. The Methodist bishops thus continue to be presbyters, elected by the representatives of the whole church, and accountable to them. They have no individual dioceses, but form 'an itinerant general superintendency.'

EPISCOPAL CHURCH, PROTESTANT: daughter or offshoot of the Church of England, agreeing with her in in doctrine, discipline, and worship. Known during the colonial period as 'The Church of England in America,' it was organized after the attainment of independence as 'The Protestant Episcopal Church in the United States of America.'

Sir Humphrey Gilbert, in 1578, received authority to settle in any unoccupied regions of the new world, and was instructed to govern any colonies which he might form by laws agreeable to the policy of England and to the faith of the established church. In that year the communion was celebrated on the shores of Frobisher's Straits. White, governor of Raleigh's second colony, baptized his granddaughter Virginia Dare and an Indian on shipboard off Roanoke Island, N. C. Sir Thomas Hariat used the Prayer-Book among the Indians in 1585. Captain R. Weymouth sailed up the Penobscot 1605, and erected a cross near where Belfast, Me., now stands. The Rev. R. Seymour and others built a church and a fort at the mouth of the Kennebec 1607, Aug., but abandoned the place the following year. Meantime a permanent settlement was effected at Jamestown, Va., where the Rev. Robert Hunt held the first services, 1607, May, under an awning; a church was soon built, and common prayer recited every morning and evening, with two sermons on Sunday, and the communion every three months. Hunt was succeeded as chaplain by Buck and Whitaker: the latter baptized Pocahontas, and was called the Apostle of Virginia. In Md. also this church had an advantage, except during the rule of the Independents, who repealed the colonial laws of toleration, and proscribed 'popery and prelacy.'

In the northern colonies the population was hostile or indifferent to the English Church, and the English clergy were infrequent visitors, though Gov. Gorges took one with him to Massachusetts Bay 1623, and another settled at Shawmut, whence he removed to R. I. 1630, on or before the building of Boston. Two of the patentees of Salem were banished thence 1629 for using the Prayer-Book. Persons who petitioned for its use at Boston, 1646 and 1664, were treated as seditious, but in 1679 King's Chapel was erected. In New York the first services, so far as known, were held 1678, and Trinity church was built and endowed 1696. In Penn. nothing appears to have been done till 1695.

The church throve as it might without ordination or confirmation, for it was never favored with the presence of a bishop, and its ministers necessarily came from England, or went thither to be ordained. The bp. of London, who was supposed to be in charge of its interests, sent to Va. as his commissary in 1685 Dr. Blair, who held the office till 1738, and sent in 1700 Dr. Bray in the same capacity to Md. The latter procured the establishment of the important Societies for Promoting Christian Knowledge and for the Propagation of the Gospel in Foreign Parts; the latter provided some clerical stipends, and sent missionaries into the

colonies where the church was not established. Before this work began, S. C. and N. C. had no Episcopal ministers; Va. had 40 parishes and Md. 26, but in each case but half as many clergy. In Penn. there were but 250 communicants and 700 attendants. In N. Y. the numbers were 450 and 1,200, and throughout New England 185 and 900. In Conn. a movement toward this church began in Yale College, when Dr. Cutler, the rector, and two tutors resigned their posts, and went to England for ordination 1723. One of them, Brown, died of smallpox abroad, and his fate deterred others from following his example. Cutler labored long at Boston, and Johnson at Stratford, Conn., enduring much persecution. Efforts were repeatedly made to procure a bp. for America, but in vain. Bequests were made to endow a see, and a house provided at Burlington, N. J., but the story, long believed, that Talbot, minister there, had received consecration from the nonjurors, appears to be disproved.

The Episcopal Church in America was all this time at a disadvantage as compared with the other religious bodies. They were self-propagating, while the sources of her organic life were across the sea. 'The fountain of all our misery,' said one, 'is the want of a bishop.' But bishops, as officers and too frequently pliant tools of a sometimes oppressive government, were coldly regarded by many who liked the service of the English Church. In Va. and Md., where the church was nominally prevalent, her members showed no such zeal for their faith and forms as did the New England Puritans. Lacking supervision, some of her ministers were of unworthy life, and her parishes had little relation to each other. There was practically no government, no bond of union, no coherence, and little spirit of union or zeal.

At the outbreak of hostilities most of the clergy and many of the laity were loyal to the crown, and the connection of the church with England made her very name a byword of reproach to the generality of patriots. In 1775 there were some eighty ministers n. of Md., mostly supported by the S. P. G. in London; this number was soon greatly reduced. After the war only one of ten clergy remained in Penn., and a single parish. In Va., of 164 churches but 69 remained, and 28 of 91 ministers; funds could not be provided to send Dr. Griffith to England, to be consecrated with Drs. White and Provoost.

From this depressed condition the church was rescued largely through the energy and prudence of Dr. White of Philadelphia. He published, 1782, Aug., a pamphlet, *The Case of the Episcopal Churches Considered*, in which he proposed a lay share in council and government, the equality of all parishes, and the election of 'a superior order of clergy,' who should assume, as far as might be, the functions of bishops, till these could be secured. The last suggestion was soon made needless; the others were incorporated in the constitution of the church. In 1783 he opened a correspondence with the few remaining clergy and with influential laymen in the several states, looking

to a revival and organization of the church. After meetings at Philadelphia, New Brunswick, and New York, the first General Convention assembled at Philadelphia, 1785, Sept. In this New England and N. C. were not represented. An address to the English bishops and a 'Proposed Book' were prepared, but neither met with favor.

Meanwhile Dr. Seabury, elected in Conn., had repaired to England for consecration. The bishops there were not authorized to dispense with the oath of allegiance, which could no longer be taken by Americans: at length, 1784, Nov. 14, he was consecrated in Aberdeen by the Scottish bishops, Kilgour, Petre, and Skinner, and returning home, 1785, June, began to exercise his office. Difficulties in England being soon after removed, Drs. White and Provoost, elected in Penn. and N. Y., were consecrated at Lambeth chapel, 1787, Feb. 4, by the two archbishops and two others, the bp. of Peterboro and the bp. of Bath and Wells.

The three bishops met as an upper house in the General Convention of 1789, at which the church was fully organized on a principle of the equality of dioceses, each of which received a representation of four clerical and four lay delegates. The constitution was mainly the work of Bp. White; he and Bp. Seabury bore the chief share in the revision of the Prayer-Book, which differs from that of England (beyond the changes necessary in passing from a monarchy to a republic) in the omission of the Athanasian Creed, and the happy substitution, in large measure, of the Scottish Communion Office. Diocesan Conventions were left to manage local affairs, while the General Convention became the supreme legislative body.

In 1790 Dr. Madison was consecrated in England as bp. of Va. All later consecrations were conducted at home; but progress for some years was slow. In 1808 and 1811 but two bishops were in attendance on the General Convention. In the latter year Bps. Hobart and Griswold were consecrated, and a vexed question about land titles called forth the formal declaration that the P. E. Church was no new body, but the one formerly known as the Church of England in America. Throughout these early years Bp. White was the presiding genius. His gentle firmness, his unfailing tact, his wise toleration, his beloved and saintly character, made him to his church what Washington was to the country. He lived to consecrate 26 bps., and see his diocese grow from nearly nothing to 86 clergy and 91 congregations. His *Memoirs of the Protestant Episcopal Church* (1820; enlarged 1836) is unfaithful to history only in belittling his own services.

A few facts and figures will illustrate the varying rates of progress. N. C., which had in 1770 eighteen clergy, could muster but 11 in 1830; it has now two large dioceses. Va., which was much weaker in 1814 than in colonial days, was revived by Bp. R. C. Moore. S. C. has arisen from nine parishes in 1786 to nearly 100. Under Bp. Doane in N. J. (1832-58) the number of clergy increased from 14 to 94, and of communicants from 800 to 4,500, the

latter since quadrupled and assigned to two dioceses. The first bishop w. of the Alleghanies was Dr. Chase, consecrated for Ohio, 1819. The first missionary bishop of the northwest, Dr. Kemper, was appointed 1835. Ill. now comprises three dioceses, Mich. three and Wis. two. Penn. has three; N. Y. five, all of good size and strength; and some of them, especially that comprising the city of New York, are marvellous for their growth in the last quarter-century—a growth now increasing even its previous rapid rate by constant accessions from other denominations. The general increase of this denomination in this century has been nearly three times that of the population. In the great cities many of the parishes are superbly and elaborately equipped with every external appliance for parochial work.

About half a century ago party spirit was rife in the Episcopal Church. Dissensions were frequent concerning ritual observances and the higher or lower theories of the church. Bishop Benjamin T. Onderdonk of N. Y., who, on charges of misconduct, was suspended from his office in 1844, was even deemed by many to have been sacrificed for opinions then considered extreme. Bishop Doane of N. J., obnoxious to some for similar reasons, was subjected to trial (1849–53), but honorably acquitted. The persecuting spirit has long since utterly ceased, and there is now probably a wider range of opinions, doctrinal and ecclesiastical, among clergy and laity, and a more unquestioning tolerance thereof, than in any other Trinitarian body. Far more stress is now laid than formerly on church architecture and decoration, music, the beautifying and popularizing of the services, and on parochial work among the destitute classes, and proportionately less stress on dogmatic distinctions. Views and practices called 'High Church' prevail in most dioceses; but party lines are not sharply drawn, and few would deny the liberty of thinking, whether to the advanced ritualist, the antique evangelical, or the modern liberal. This freedom and lack of insistence on theories and symbols, deplored by some as a source of weakness, is rejoiced in by more as a sign of truth and strength. 'The roomiest church in America,' as it has been called, allowing for varieties of temperament, emphasizing the practical side of religion, having for its root-idea education rather than conversion, and not exacting a prescribed routine of spiritual experience, may, of course, be sought by some from mixed or unworthy motives; but it aims at inclusion, considering itself not so much a communion of saints as a nursery for heaven.

The bishops in this church, though endued with high powers, have become notable for that paternal, even fraternal, spirit which gives to any exercise of power its highest warrant. See BISHOP.

In every diocese the bishop and his clergy in person, and the laity by their delegates, meet often as once a year in the Diocesan Convention, or Council. This body exercises legislative authority in its diocese, enacting canons of discipline, admitting new parishes, electing a

bishop in case of vacancy, voting on changes in the Prayer Book if proposed by the General Convention, etc.

The supreme legislative authority for the whole church is exercised by the General Convention as representative of all the federated dioceses. It meets once in three years, and consists of two co-ordinate bodies, the House of Bishops, and the House of Clerical and Lay Deputies. For its decisions a concurrent vote in both these houses is requisite; and, on demand of the House of Deputies, the vote must be 'by dioceses and orders'; i.e. a majority, to be conclusive, must be a majority of all the dioceses as represented in convention by their *clergy*, concurring with a majority of all the dioceses as represented by their *laity*.

Of more than 150 bishops, past and present, two have left this church: L. S. Ives of N. C., who went to the Church of Rome 1853, and G. D. Cummins of Ky., who started the Reformed Episcopal Church (q.v.) 1873. One bishop has been deposed on moral grounds. Five have resigned their office—all missionary bishops, and four of them in foreign fields; the fifth was afterward elected to a diocese.

During the civil war a temporary schism occurred, as in other denominations seated in both the north and the south. The southern dioceses organized themselves as the 'Church in the Confederate States,' and were not represented in the General Convention of 1862; but in that of 1865 their bishops and delegates were welcomed back, and a reunion was at once effected.

This church increasingly recognizes the need of cathedrals, not only to supply models of dignified worship, but also to stand as visible centres of administration in their respective dioceses. From the cathedral, with the bishop and his organized staff, may be sent forth in orderly lines the incentive and the guidance for all Christian work, educational and charitable. The diocese of N. Y. has now under construction, on a commanding eminence in the upper part of New York city, the Cathedral of St. John the Divine, which, in grandeur, in beauty, and as a model of adaptedness to the manifold uses of a central diocesan establishment, is expected to be the noblest ecclesiastical edifice in the country.

Official reports of 1903 show the following for 1902: Clergy, 4,971; candidates for orders, 448; postulants, 288; lay readers, 1,935; parishes and missions, 6,647; baptisms, 59,016 (infant 46,031, adult 10,704); confirmed, 46,171; marriages, 21,125; burials, 34,761; communicants, 758,052, an inc. over preceding year of 14,193, or 2 per cent., and an inc. of 138,614 in seven years; S. S. teachers, 46,318; scholars, 416,573. Church is the strongest in N. Y. State. Total contributions, $15,146,470, making an average per member of $19.98; highest average in any state, N. Y., $33.83; lowest, S. D., $5.98.

This church, through General Convention or otherwise,

supports a number of educational institutions. The theological schools are: the General Theol. Seminary, New York city, established 1817; Virginia Theol. Sem., near Alexandria, 1823; Bexley Hall, Gambier, O., 1825; Nashotah House, Nashotah, Wis., 1841; Berkeley Divinity School, Middletown, Conn., 1854; Seabury Divinity School, Faribault, Minn., 1860; Divinity School, Philadelphia, 1862; Episc. Theol. School, Cambridge, Mass., 1867; Theol. Dept. Univ. of the South, Sewanee, Tenn., 1868; Western Theol. Sem., Chicago, Ill., 1885; Lee Hall, Davenport, Ia. Diocesan schools are at San Mateo, Cal.; Denver, Colo.; Topeka, Kan.; Geneva, N. Y. (De Lancey Divinity School); Syracuse, N. Y. (St. Andrew's Divinity School); Shanghai, China; and Tokio, Japan. Prominent among church colleges are: the Univ. of the South, Sewanee, Tenn., est. 1868, with 29 instructors and 296 students; Kenyon Coll., Gambier, O., 1834, with 19 instructors and 180 students; Griswold Coll., Davenport, Ia., 1859, with 26 instructors and 180 students; Hobart Coll., Geneva, N. Y., 1825, with 17 instructors and 81 students; Trinity Coll., Hartford, Conn., 1823, with 19 instructors and 130 students; and Racine Coll., Racine, Wis., 1853, with 6 instructors and 40 pupils.

A list of other institutions will give some idea of the varied activities of this church. The Domestic and Foreign Missionary Soc. has for its members all baptized persons in the church, and is governed by a council consisting of all the bishops and numerous clergy and laymen. The Church Building Fund Commission, organized 1880; the Church Society for Promoting Christianity among the Jews; the Commission for Church Work among Colored People; and the Church University Board of Regents; incorporated 1890. These, and a Fund for the Relief of Widows and Orphans of Deceased Clergymen, and of Aged, Infirm, and Disabled Clergymen, are controlled by General Convention. The American Church Missionary Soc., incorporated 1861, and the Evangelical Education Soc., 1861–69, represent the 'Low Church' party. The Soc. for the Increase of the Ministry, 1859, has its headquarters at Hartford, Conn. The N. Y. Bible and Common Prayer-Book Soc. was founded 1809; the Prot. Episc. Soc. for Promotion of Evangelical Knowledge, incorporated 1848, has its publishing house in New York. The Free and Open Church Association, aims to substitute free seats for rented pews. Missions to Deaf Mutes are in New York and at Gambier, O. The Clergymen's Mutual Insurance League was incorporated 1869, the Clergymen's Retiring Fund Soc. 1874, the Soc. of St. Johnland 1870. The Church Congress (q.v.) meets annually. Other institutions are the Church Temperance Soc., the Western Church Building Soc., the Church Unity Soc., the Brotherhood of St. Andrew (with over 1,100 chapters and 13,000 members), the White Cross Soc., the Parochial Mission Soc., the Confraternity of the Blessed

Sacrament, the Soc. for the Home Study of the Holy Scripture and Church History, the Guilds of the Holy Cross, of the Iron Cross, of S. Barnabas for Nurses (with branches in all large cities and over 1,700 members), and of All Souls (1873), the Church Assoc. for the Advancement of the Interests of Labor, Men's Help Soc., the Christian Social Union in the U. S., Knights of Temperance, and Young Crusaders, Woman's Auxiliary to the Church Temperance Soc., Church Students' Missionary Assoc. (1888), the American Church League, the Church German Soc. (1879), Soc. of King Charles the Martyr (1894), the Order of the Daughters of the King (1885), the Order of the Sisters of Bethany (1891), the Community of St. Benedict (1894), the Church Periodical Club, American Church Sunday-school Institute, and the Church Army (1896). Some of these have acquired much influence. There are also a large number of Sisterhoods, which have charge of schools, hospitals, orphanages, etc., in all parts of the country; and there are several religious orders for men and many church clubs. It is evident that this church is not content with offering historic claims and an attractive service, but is endeavoring to do her share of work among all classes of the community.

A peculiarity in the distribution of the membership of the Protestant Episcopal Church in the U. S., is the centering of her strength in the large cities, 38 per cent. of the entire number being massed in 44 of the principal cities. According to states, this peculiarity is shown as follows: in Cal. nearly one-third of the total membership in the state is in San Francisco; in Colo. about one-half in Denver; in Conn. about one-third in the cities of New Haven, Hartford, Bridgeport, and Waterbury; in Del. about one-half in Wilmington; in Ga. more than one-half in the cities of Savannah, Atlanta, and Augusta; in Ala. nearly one-third in Mobile; in Ill. one-half in Chicago; in Ind. one-fifth in Indianapolis; in Ky. one-half in Louisville; in La. three-fifths in New Orleans; in Me. nearly one-third in Portland; in Md. more than two-fifths in Baltimore; in Mass. nearly one-fourth in Boston; in Mich. about one-third in Detroit; in Minn. nearly one-half in the cities of Minneapolis and St. Paul; in Mo. more than four-fifths in St. Louis; in Neb. two-fifths in Omaha; in N. J. about one-third in the cities of Jersey City, Newark, Orange, and Camden; in N. Y. considerably more than one-half in the cities of New York, Brooklyn, Buffalo, Rochester, Albany, Troy, Utica, and Syracuse; in O. more than two-fifths in the cities of Cleveland, Cincinnati, and Toledo; in Penn. three-fifths in the cities of Philadelphia and Pittsburg; in S. C. two-fifths in Charleston; in Tenn. one-third in Memphis and Nashville; in Va. one-fourth in the cities of Richmond and Norfolk; in Wis. one-fifth in Milwaukee.

EPISCOPAL CHURCH, REFORMED: organized by members of the Prot. Episc. Church, who give substantially the following statement of the events and circumstances which, as they believe, justify their course. 1. The Protestant Reformation in England had outwardly a political origin (in the act of the king, Henry VIII., renouncing allegiance to the pope, and proclaiming himself head of the English Church), by which the work was biased and cut short. During the brief life of the young king Edward VI., the regent, or protector, being in favor of the Reformation, great progress in it was made. Under Mary the supremacy of the pope was again acknowledged. When Elizabeth became queen, wishing to harmonize her divided subjects, and hoping for reconciliation with Rome, she strove to have the liturgy framed so as to satisfy both parties. Consequently it contained contradictory elements. At a later period, when she had found her hope futile, the articles of faith adopted were decidedly Protestant. Thus it came to pass that in the Church of England two parties found support in her ritual; the one Protestant; the other having an affinity with Rome. 2. After the American revolution, when the Church of England in the colonies became the Prot. Episc. Church in the United States, the Book of Common Prayer, having been adopted without material alterations, retained its conflicting elements. 3. The Tractarian movement, which began at Oxford, 1833, was a successful endeavor to revive the principles of antiquity and Catholicity contained in the Prayer Book, in opposition to its Protestant elements. It discarded Prot. principles and taught the doctrines of apostolic succession, priestly absolution, baptismal regeneration, the real presence, and the authority of the church. 4. These teachings produced a powerful effect in the United States also. A great increase of ritualism and of the drift toward Rome was soon manifested; the opposition between the 'High' and the 'Low Church' parties was intensified, and practical measures were adopted by each which widened the chasm. 5. Several subsequent public events fanned the flame of discontent; especially the censure of one clergyman for preaching in a Methodist church, and the suspension of another for omitting the word 'regenerate' in the baptismal office. 6. Remonstrances and petitions for relief, which were numerously and urgently presented to the General Convention, produced no effect. 7. During the sessions of the Evangelical Alliance in New York 1873, Oct., Bp. Cummins, of the diocese of Kentucky, having, by invitation, officiated at a union celebration of the Lord's Supper, in company with representatives of other denominations, was for this act of Christian fellowship bitterly censured, through the press, by members of the 'High Church' party. After this, convinced that he could no longer rightfully continue in a church whose theory and practice (as interpreted by the majority of its members) denied the brotherhood of believers in Christ, Bp. Cummins withdrew from the ministry of the Prot. Episc. Church. 8. This led to the or-

ganization, 1873, Dec. 2, of the Reformed Episcopal Church, of which Dr. Cummins and the Rev. Dr. Charles E. Cheney were elected bishops. At the same time the following declaration of principles was adopted: 'I. The Reformed Episcopal Church holding the faith once delivered to the saints,' declares its belief in the Holy Scriptures of the Old and New Testaments as the Word of God, and the sole rule of faith and practice; in the creed commonly called the Apostles' creed;' in the divine institution of the sacraments of baptism and the Lord's Supper; and in the doctrines of grace substantially as they are set forth in the Thirty-nine Articles of Religion. II. This church recognizes and adheres to Episcopacy, not as of divine right, but as a very ancient and desirable form of church polity. III. This church, retaining a liturgy which shall not be imperative or repressive of freedom in prayer, accepts the Book of Common Prayer, as it was revised, proposed and recommended for use by the General Convention of the Prot. Episc. Church, 1785; reserving full liberty to alter, abridge, enlarge, and amend the same as may seem most conducive to the edification of the people, 'provided that the substance of the faith be kept entire.' IV. This church condemns and rejects the following erroneous and strange doctrines as contrary to God's Word: 1. That the church of Christ exists only in one order or form of ecclesiastical polity. 2. That Christian ministers are 'priests' in another sense than that in which all believers are 'a royal priesthood. 3. That the Lord's table is an altar on which the oblation of the body and blood of Christ is offered anew to the Father. 4. That the presence of Christ in the Lord's Supper is a presence in the elements of bread and wine. 5. That regeneration is inseparably connected with baptism.' To this statement it may be added that in this church the bishops do not constitute a separate order, but are presbyters; in council they vote with and as their brother presbyters.

EPISCOPAL SYSTEM, in the Roman Catholic Church: theory which claims for the whole body of bishops the supreme power in the church. It was brought out strongly by the conflicting papal elections which, commencing 1378, established rival popes at Avignon and at Rome. The council of Pisa (1409) cited the rivals before them, and, on their refusal to appear, deposed them. The council of Constance (1414) finding three rival popes deposed them all. The council of Basel (1431) denied the right of the pope to dissolve it, and cited him to appear at its bar. In 1439 it declared him a heretic, and afterward deposed him. In later times the superiority af a general council over the pope continued to be maintained by the Gallican Church in opposition to ultramontanism. But the Vatican council (1870) declared that the pope is superior to all councils; and, when speaking officially on faith and morals, is infallible. This decision has, for the present, overwhelmed the episcopal system in the Rom. Cath. Church.

EPISCOPIUS, *ĕp-ĭs-kō′pĭ-ŭs*, Simon (Dutch name, Bisschop): 1583–1643; b. Amsterdam: head of the Arminian party after the death of Arminius. He studied at Leyden, took his degree 1606, and was ordained pastor of the village of Bleyswyck near Rotterdam 1610. In the following year, the states-general, with the intention of putting an end to the agitations created by the controversies between the Gomarists or Calvinistic party and the Arminians or Remonstrants, ordered a conference to be held in their presence at the Hague between six ministers of each party. Episcopius was one of the six charged with the advocacy of Arminianism, and highly distinguished himself by good temper, ability, and learning. In 1612, the curators of the Univ. of Leyden appointed him prof. of theology in place of Gomar, who had gone to Seeland. This enraged the leaders of the orthodox party, who unscrupulously accused Episcopius of Socinianism, and of having entered into an alliance with the Rom. Catholics for the destruction of Protestantism. By this the fanaticism of the populace was roused; he was insulted and abused in the street, and on one occasion narrowly escaped being stoned to death. The house of his brother in Amsterdam was sacked, under the pretext that it was a rendezvous of the Remonstrants. In 1618, occurred the famous Synod of Dort (q.v.). Episcopius was present, with several other Arminians. The Calvinists, who were in an overwhelming majority, would not allow him to speak; they told him that the synod was met not to discuss, but to judge; and all the proceedings exhibited the bigotry and tyranny to which ecclesiastical tribunals have been deemed liable. Expelled from the church, and banished from the country, Episcopius betook himself first to Antwerp, afterward to Rouen and Paris, but 1626 returned to Rotterdam, where the *odium theologicum* against his party had become less virulent. Here he married in 1630, and four years later was made primarius prof. of divinity in the newly established college of the Remonstrants. Episcopius held enlightened principles in regard to religious toleration. Not placing a high value on merely doctrinal views, but trusting rather to the efficacy of the Christian spirit to elevate and purify the character, and seeing, moreover, the presence of this spirit in men holding the most conflicting opinions (when not inflamed with controversial hates), he was desirous of a broader and more catholic bond of unity among Christians than the opinionative creeds of his day permitted. His chief works are his *Confessio Remonstrantium* (1621), *Apologia pro Confessione* (1629), and *Institutiones Theologicæ*, incomplete. A complete ed. of his works appeared Amsterdam (2 vols. 1650).

EPISKELETAL, a. *ĕp-ĭ-skĕl′ĕ-tal* [Gr. *epi*, upon; Eng. *skeleton*]: in *anat.*, above the embryonic vertebral axis; name given by Huxley to what Quain calls epiaxial.

EPISODE, n. *ĕp′ĭ-sōd* [F. *épisode*—from Gr. *epei′sŏdŏs*, a coming in besides—from *epi*, *eisŏdŏs*, a coming in—

from *eis*, into: *hodos*, a way]: an incidental narrative or digression introduced for the purpose of giving greater variety to the events related. EP'ISOD'IC, a. *-sŏd-ĭk*, or EP'ISOD'ICAL, a. *-ĭ-kăl*, pertaining to or contained in an episode. EP'ISOD'ICALLY, ad. *-lĭ*.

EPISPASTIC, a. *ĕp'ĭ-spăs'tĭk* [Gr. *epĭspăstĭkos*—from *epi*, upon; *spaō*, I draw]: in *med.*, drawing; blistering: N. that which acts as a blister.

EPISPERM, n. *ĕp'ĭ-spėrm* [Gr. *epi*, upon; *sperma*, the seed]: in *bot.*, the external covering of the seed. EP'ISPORE, n. *-spōr*, the outer covering of some spores.

EPISTAXIS, n. *ĕp'ĭ-stăk'sĭs* [Gr. *epi*, upon; *stāzein*, to drop]: nosebleed.

EPISTEMOLOGY, n. *e-pĭs-tēē-mŏl'ŏ-jĭ* [Gr. *ĕpĭstēmē*, knowledge; *lŏgĭā*, discoursing]: the science of knowledge as such. Historically epistemology proposes a systematic inquiry into the origin, certainty, nature and limits of knowledge. The ancients, especially Plato and Aristotle, discussed some questions of epistemology, chiefly those relating to the truth and universal validity of knowledge; but the founder of the science was Locke, though Kant has done even more to give it a secure foundation.

By some writers 'logic' is used to cover this field, other writers confine 'logic' to the formal principles of thought, reserving epistemology for the science which treats of the most general contents of knowledge.

If epistemology means the obtaining of knowledge or knowing, the processes leading to knowledge, as Ferrier, who first gave currency to the term, claims, epistemology is a branch of applied psychology, for these processes are simply functions of mind, whose subject-matter is all the conscious processes involved in obtaining knowledge—perception, memory, imagination, thought, etc. The problem, then, to be investigated is: 'what must be the nature of those mental functions which lead, have led, and can lead to knowledge?' This teleological (see TELEOLOGY) point of view clearly makes epistemology a branch of applied psychology. But epistemology forms the presupposition of all the sciences dealing with knowledge, and it also considers the important questions of the validity and limits of human knowledge. The several special sciences presuppose and apply certain comprehensive concepts whose adequate consideration does not fall within the limits of these sciences. Epistemology investigates these comprehensive concepts which are common and essential to the special sciences.

Is knowledge possible? is the first question epistemology must answer. The limits of knowledge cannot be determined till this question is affirmatively answered. Here belong such problems as: what is contained within experience and what is beyond it—the distinction between 'transcendence' and 'immanence?' what in human knowledge is independent of experience yet evoked

by it, and what is dependent upon it—the Kantian distinction between *a priori* and *a posteriori*? what is the meaning and what are the conditions of the 'necessity' and 'universal validity' of pure truth—the inquiry into the nature of the contents of necessary and universal pure truth.

The second problem of epistemology is to investigate the truth and the meaning of the division of the contents of knowledge into 'subjective' and 'objective'. Another problem of epistemology is the truth and validity of the division of the elements of knowledge into 'formal' and 'material.'

The man who rises above the needs of his animal nature has some conception of the relation of knowledge to reality, as he has some conception of the nature of God and of the world. Scepticism claims that positive and certain truth is not possible to man, and to one who thinks, this claim is a call to warfare either as an ally or as an antagonist. The claim of relativism that our knowledge of things, being a mere effect produced by the things on our minds, may be not knowledge of the things but only a false belief about the things, though this claim if true logically necessitates a doubt of our knowledge of what is in our minds, is a challenge to thought that cannot be declined. Epistemology must investigate the general contents of knowledge to determine whether scepticism, agnosticism, etc., are correct in condemning all knowledge because it does not meet certain conditions. If human knowledge would make good its claim that it correctly represents reality, epistemology is a necessity.

EPISTERNA, n. *ĕp-ĭ-stėr'na* [Gr. *epi*, upon; *sternon*, the breast; the chest]: in *zool.*, lateral pieces of the inferior or ventral arc of any somite in a crustacean.

EPISTERNAL, a. *ĕp'ĭ-stėr'năl* [Gr. *epi*, *sternon*, the breast-bone]: situated on or above the sternum or breast-bone. EPISTER'NUM, n. *-nŭm*, the upper part of the sternum or breast-bone.

EPISTHOTONOS, n. *ĕp'ĭs-thŏt'ŏ-nŏs* [Gr. *episthen*, forward; *teinō*, I bend or stretch]: in *med.*, a spasmodic affection in which the body is bent forward; a less common form denoting the same as EMPROSTHOTONOS.

EPISTILBITE, n. *ĕp'ĭ-stĭl'bīt* [Gr. *epi*, upon; *stĭlbē*, lustre]: see STILBITE.

EPISTLE, n. *ĕ-pĭs'l* [L. *epistŏlă;* Gr. *epistolē*, anything sent by a messenger—from *epi*, upon; *stellō*, I send: Sp. and It. *epistŏlă*]: a letter; a writing or communication to be sent; in the *service of some churches*, a Scripture lesson read usually from one of the Apostolic speeches, though some times from other books of Scripture; a part of the service supposed to be as old as the 6th c. EPIS'TOLARY, a. *-tō-lėr-ĭ*, pertaining to letters or correspondence; contained in letters. EPISTOLIC, a. *ĕp'ĭs-tŏl'ĭc*, or EP'ISTOL'ICAL, a. *-ĭ-kăl*, pertaining to letters or epistles. EPIS'TLER,

n. *-pĭs′lėr*, old name for the priest who reads the epistle in the Communion Service. EPISTLE SIDE OF THE ALTAR, left side of the altar or communion table (looking from it along the church), at which in the church service the epistle of the day is read. It is of less distinction than the right or gospel side, and is occupied by the clergyman of lower ecclesiastical rank.

EPISTOLÆ OBSCURORUM VIRORUM, *ē-pĭs′tō-lē ŏb-skū-rō′rŭm vī-rō′rŭm* (Lat., Letters of Obscure Men): collection of satirical letters which appeared at the commencement of the 16th c., and professed to be the composition of certain ecclesiastics and professors in Cologne and other places in Rhenish Germany. They were directed against the scholastics and monks, and lashed with merciless severity their doctrines, writings, morals, modes of speech, manner of life, follies, and extravagances, and thus helped to bring about the Reformation. The controversy of Reuchlin with the baptized Jew, Pfefferkorn, concerning Hebrew punctuation, gave the first occasion to the *Epistolæ*, and it is probable that their title itself was suggested by the *Epistolæ Clarorum Virorum ad Reuchlinum Phorcensum* (1514). They were addressed to Octuin Gratius in Deventer, who was far from being so complete an ignoramus as might be supposed from this circumstance, but who had made himself odious to the liberal minds of the time by his arrogant pretensions and his determined hostility to the rising spirit of reform. On the first appearance of the work, it was ascribed to Reuchlin; afterward, to Reuchlin, Erasmus, and Hutten. More recent investigators have inclined to the belief, that the *first* part, which appeared at Hagenau 1515 (but professedly at Venice), was the production of Wolfgang Angst, learned and witty bookprinter of that town; but, latterly, doubt has been expressed whether even he had anything to do with the *Epistolæ*. In the composition of the second part (published 1519), Erotus Rubeanus had, after Ulrich von Hutten, the most considerable share. The placing of the *Epistolæ* in the catalogue of forbidden books by a papal bull, helped to spread it. Among numerous editions of the work (1643, 1703, 1827, etc.), the best is by Böcking (1858; 2d ed. 1864). See D. F. Strauss's *Ulrich von Hutten*.

EPISTOME, n. *ĕp-ĭs′tō-mē* [Gr. *epi*, upon; *stoma*, a mouth]: a valve-like organ which arches over the mouth in certain of the polyzoa.

EPISTOMIUM, n. *ĕp′ĭ-stō′mĭ-ŭm* [Gr. *epistŏmĭŏn*, a gag, a stopple]: the cock or spout of a water-pipe, or of any vessel containing liquids to be drawn off in small quantities when required. EP′ISTO′MEUS, a. *-ŭs*, spigot-shaped.

EPISTROPHE, n. *ĕ-pĭs′trō-fĕ* [Gr. *epistrŏphē*, a turning toward, conversion—from *epi*, upon; *strŏphē*, a turning]: in *rhet.*, a figure in which each member of a sentence concludes with the same affirmation.

EPISTROPHY, n. *ĕ-pĭs′trō-fĭ* [Gr. *epistrŏphē*, a turning

about—from *epi*, upon; *strŏphē*, a turning]: in *bot.*, the reversion of a monstrous or variegated form to a normal one; a mode of distribution of protoplasm and chlorophyl granules on free cell-walls under the action of light.

EPISYLLOGISM: see CHAIN in Logic.

EPITAPH, n. *ĕp′ĭ-tăf* [F. *épitaphe*—from L. *epĭtăphĭŭm*—from Gr. *epi*, upon; *taphos*, a tomb, a sepulchre]: inscription on a monument or tombstone in memory or honor of the dead. EP′ITAPH′IC, a. *-ĭk*, or EP′ITAPH′IAN, a. *-ĭ-ăn*. EP′ITAPHIST, n. a writer of epitaphs.—From originally signifying a monument, this word is now used exclusively to designate the commemorative inscription on a monument or tombstone. This perversion may in some measure have arisen from the remembrance of the funeral orations which the ancients were in the habit of pronouncing at funerals. But the epitaph, in its stricter sense, was well known to the classical nations of antiquity; and, indeed, by every people a brief commemoration of the heoric actions or personal virtues of their illustrious dead has been regarded as one of the worthiest occupations of the faculties of the living. As epitaphs were not only engraved on the most enduring substances, but from their brevity were easily preserved in the memory and orally transmitted, wherever we find the literature of a people at all we are likely to discover specimens of their epitaphs. Pettigrew has translated several from Egyptian sarcophagi (Bohn's edition, p. 5), but they are of no great interest. Herodotus (vii. 228) has preserved to us those which the Amphictyons caused to be inscribed on the columns which they raised in honor of the heroes of Thermopylæ, and that which Simonides, from personal friendship, placed on the tomb of the prophet Megistias. The general inscription for the whole of them was to this effect: 'Four thousand from Peloponnesus once fought on this spot with three hundred myriads;' and that which was special to the Spartans was still more memorable: 'Stranger, go tell the Lacedemonians that we lie here obedient to their commands.' The *Anthologia Græca*, edited by Brunk, subsequently by Jacobs, contains the largest collection of Greek epitaphs; of these many were translated and published by Bohn, 1854, under the editorial care of Mr. George Burges. Of Roman epitaphs antiquarian museums in many European countries, and in the United States, present numerous examples; for the form in which they were conceived was adopted by our own Romanized forefathers, and many a stone bearing the well-known *D. M.* (*Diis Manibus*), or *Siste Viator*, probably covered the remains of those whose veins never contained a drop of Roman blood. A very interesting collection of early Christian epitaphs is in Dr. Charles Maitland's *Church in the Catacombs*, 1846. The naturally epigrammatic turn of the French mind peculiarly adapts it for this species of composition, and in French collections, such as the *Recueil d'Epitaphes*, very felicitous examples

are found both in Latin and in French. Of the former may be mentioned the 'Tandem felix!' which the Count de Tenia, who had enjoyed every form of temporal prosperity, caused to be engraved on his tomb; and of the latter, the touching epitaph to a mother, 'La première au rendez-vous.' A large portion of the earlier monuments, and consequently of the epitaphs of Britian, were destroyed at the Reformation, and subsequently by the iconoclastic rage of the Puritans and Presbyterians. But at a later date, no literature, ancient or modern, vies with that of England in this peculiar branch, for while English epitaphs possess the point and terdeness without which no epitaph can be successful, they exhibit a feature almost unknown in those of other nations—that, viz., of wit, or perhaps more properly, of humor. It seems as if the English had found it impossible to confine their raillery to the living, and that it had overflowed upon the tombstones in recalling the harmless peculiarities of the dead. There are many excellent old collections of epitaphs, such as the *Thesaurus Epitaphiorum* of Philip Labbe, Paris 1666. Of modern ones, the best is that of Pettigrew, published by Bohn, arranged to mark the diversity of taste prevailing at different periods of our history. See also the works of Gruter, Græsius, Reinesius, Muratori, Mazochius; the *Monumenta Anglicana*, London 1719; Weever's *Ancient Funeral Monuments*, etc.

EPITASIS, n. *ĕ-pĭt′a-sĭs* [Gr. a stretching—from *epi*, upon, over; *teinō*, I stretch]: in *anc. drama*, that part of a play in which the plot thickens; the part which embraces the main action of the play; opposed to protasis (q.v.).

EPITHALAMIUM, n. *ĕp′ĭ-thă-lā′mĭ-ŭm* [L.—from Gr. *epithălamĭon*, that which appertains to the bridal-chamber, the bridal song—from *epi*, upon; *thalămos*, a bed-room: F. *épithalame*]: nuptial song in honor of the bride and bridegroom. The Greeks and Romans sang such a poem in chorus near the bridal-chamber (*thalamus*) of a newly married pair. Anacreon, Stesichorus, and Pindar composed poems of this kind, but only scanty fragments have been preserved. The epithalamium of Peleus and Thetis by Catullus is one of the finest specimens of Latin poetry extant; but probably the most gorgeous epithalamium in all literature, is that of the English poet Spenser. A collection of Greek and Latin epithalamia is in Wernsdorf's *Poetæ Latini Minores* (IV. part 2).

EPITHECA, n. *ĕp′ĭ-thē′kă* [Gr. *epi*, upon; *thēkē*, a sheath, a box]: a continuous layer surrounding the thecæ in some corals externally. EPITHECIUM, n. *ĕp′ĭ-thē′sĭ-ŭm*, the surface of the fructifying disk in certain fungi and lichens.

EPITHELIOMA, n. *ĕp′ĭ-thē′lĭ-ō′mă* [formed from *epithelium*, which see]: epithelial cancer, occurring on tegumentary or mucous surfaces, the lips and cheeks being the parts most commonly affected by it: see EPITHELIUM: CANCER.

EPITHELIUM, n. *ĕp-ĭ-thē′lĭ-ŭm* [Gr. *epi*, upon; *thēlē*, the nipple, or *thallō*, I grow]: in *anatomy*, layer of cells forming the surface of all the mucous membranes of the body; in *plants*, a finer epidermis having extremely fine cells filled with colorless fluid, and lining the ovary, etc. EP′ITHE′LIAL, a. *-ăl*, pertaining to or formed of. EPITHELIATED, a. *ĕp′ĭ-thē′lĭ-ā-tĕd*, covered with a very delicate lining, as a serous cavity, a membrane, etc.—*Epithelium* in anatomy is the cell-tissue which, in layers of various thickness, invests not only the outer surface of the body, and the mucous membranes connected with it—as, for example, those of the nose, lungs, intestinal canal, etc.—but also the closed cavities of the body, such as the great serous membranes, the ventricles of the brain, the synovial membranes of joints, the interior of the heart, and

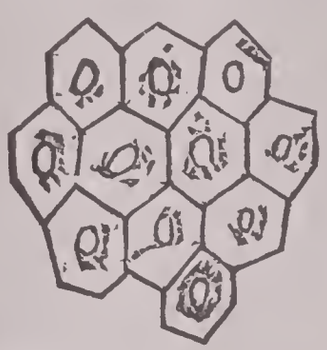


Fig. 1.
Epidermis (still soft like the epithelium of internal parts) of a two months' human embryo. Mag. 350 diam.

Fig. 2.
Epithelial cells of the vessels; the longer one from the arteries, the shorter ones from the veins.

of the blood-vessels proceeding to and from it, the ducts of glands, etc. This is the meaning now generally given to the word, though originally it was reserved for the surface layer of cells in mucous membranes only.

The thickness of this tissue varies extremely with the position in which it occurs. In some parts it consists of

Fig. 3.
Epithelium of the intestinal villi of the rabbit. Mag. 300 diam.

numerous strata of cells, collectively forming a layer of more than a line in thickness; in other parts, it is composed of only a few strata, or often of a single stratum of cells, and can be detected only by the microscope.

The cells of which the epithelium is composed are usually soft nucleated cells; they may be rounded, polygonal, fusiform, cylindrical, or conical in shape, and

sometimes they possess vibratile cilia, the appearance and uses of which are explained below. See CILIA.

(*a*) *Epithelium in a single stratum* may be composed of:

1. *Rounded, polygonal cells*, constituting the variety known as pavement or tesselated epithelium, and occurring as an investment of the serous membranes, of most synovial membranes, of the lining membrane of the heart and of the veins, of the canals of glands, etc.

2. *Fusiform, superficially united cells* (fusiform epithelium), as the epithelium of the arteries and of many veins.

3. *Cylindrical cells* (cylinder epithelium), as in the intestine from the stomach to the termination of the alimentary canal, in the excertory ducts of all the grands opening into the intestine, etc. For illustrations of this cylinder epithelium, see DIGESTION, ORGANS AND PROCESS OF.

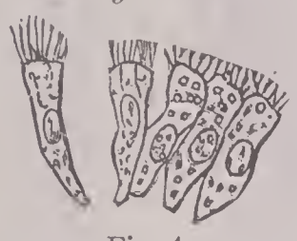


Fig. 4.
Ciliated cells from the finer bronchial tubes. Mag. 350 diam.

4. *Cylindrical or conical ciliated cells*, as the epithelium of the more minute bronchial tubes, of the nasal cavities, and of the uterus.

5. *Rounded ciliated cells*, as the ciliated pavement epithelium of the ventricles of the brain in the fetus.

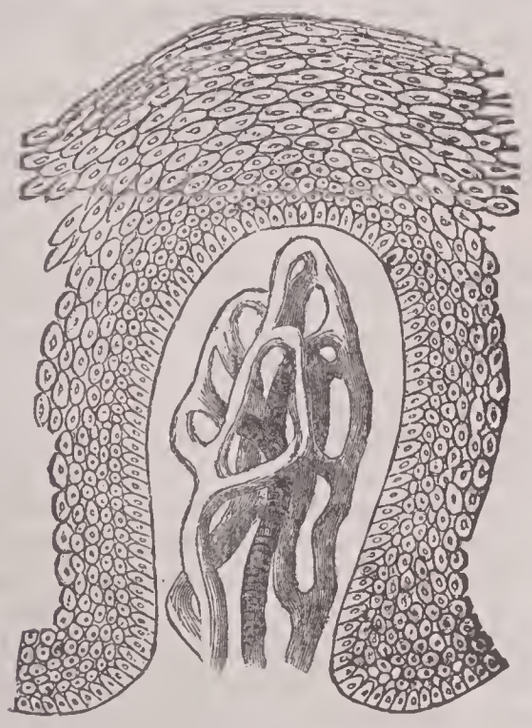


Fig. 5.
Laminated pavement epithelium investing a simple papilla (with blood-vessels in the interior) from the gums of a child. Mag. 250 diam.

(*b*) *Epithelium in many layers* may be composed of:

1. *Cylindrical or rounded cells below, and more or less flattened cells above.* This is termed laminated pavement epithelium, and occurs in the mouth, lower part of pharynx, esophagus, bladder, etc.

2. *Rounded cells below, more elongated ones in the middle, and ciliated conical ones above.* This is termed laminated ciliary epithelium, and occurs in the larynx, trachea, and larger bronchial tubes, in the greater part of the nasal cavity, etc.

In all the varieties of epithelium, the layer of external cells is being constantly disintegrated and replaced by the layer immediately beneath.

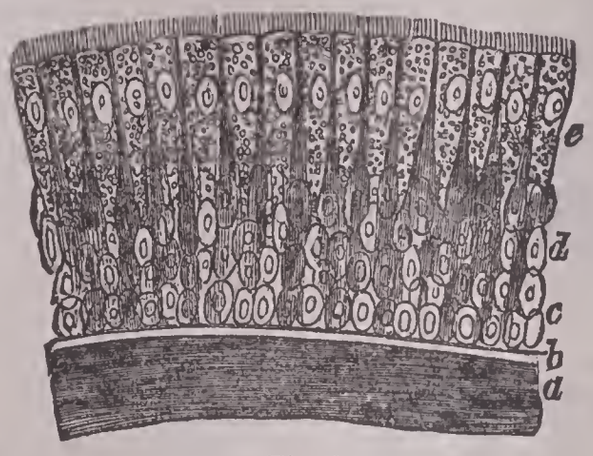


Fig. 6.

Ciliated epithelium from the trachea of a man. Mag. 350 diam. *a*, outermost part of the elastic longitudinal fibres; *b*, homogeneous outermost layer of the mucous membrane; *c*, deepest round cells; *d*, median long cells; *e*, outermost conical cilated cells.

The uses of the chief varieties of epithelium, especially of ciliated epithelium, are as follows:

The polygonal or pavement epithelium mainly acts like the epidermis, as a protecting medium to the soft parts beneath.

The cylindrical epithelium additionally takes an active part in the process of secretion. For illustrations of the function of the cells forming this variety of epithelium, see CELLS, ANIMAL; DIGESTION, ORGANS AND PROCESS OF: further see SECRETION.

In connection with ciliated epithelium, *ciliary motion* generally, so far as it occurs in the animal kingdom, is to be noticed. Certain surfaces which are lubricated by a fluid, are covered with a multitude of hair-like processes of extreme delicacy and minuteness (their length varying from $\frac{1}{1000}$ to $\frac{1}{12000}$ of an inch), which from their shape are termed *cilia*, from *cilium*, an eyelash (see CILIA). During life, and for a certain period after death, these filaments exhibit a remarkable movement, each cilium bending rapidly in one direction, and rapidly returning to its original position (according to Krause, these movements range from 190 to 230 in a minute). On examining a ciliated surface with a high magnifying power, the motion presents an appearance somewhat resembling that of a cornfield agitated by a steady breeze. Any minute objects coming in contact with the free extremities of the cilia are urged onward in the direction of the predominant movement; and the best method of observing the course

of the ciliary current is to sprinkle the surface with a little powdered charcoal, grains of which may speedily be seen to move onward in a definite direction.

An easy way to observe this phenomenon is to detach, by scraping with a knife, a small piece of epithelium from the back of the throat of a living frog. The scales, moistened with water or serum, will continue to exhibit the movement of their adherent cilia for a considerable time, provided the piece be kept duly moistened. In a turtle, after death by decapitation, it lasted, in the mouth, 9 days; in the trachea and lungs, 13 days; and in the esophagus, 16 days. In man and mammals, it seldom lasts two days, and usually ceases much sooner. The necessary condition for the movement appears to be the integrity of the cells to which the cilia are attached; for as soon as these shrink up for want of moisture, or undergo any physical change, the cilia cease their characteristic action. We know nothing regarding the mechanism or source of ciliary motion, except that (as it continues on detached epithelium) it is independent of both the vascular and nervous systems. This phenomenon exists very widely throughout the animal and vegetable kingdoms.

EPITHEM, n. *ĕp′ĭ-thĕm* [Gr. *epithĕmă*, that which is laid upon a thing—from *epi*, upon; *tithēmī*, I place]: in *med.*, a liquid in which cloths may be dipped to be laid on any part of the body; a poultice.

EPITHET, n. *ĕp′ĭ-thĕt* [L. *epithĕton*, an epithet—from Gr. *epithĕtŏs*, added or put to, annexed—from *epi*, upon; *tĭthēmī*, I place]: a word which expresses some real quality of the thing to which it is applied. EP′ITHET′IC, a. *-ĭk*, pertaining to; abounding with epithets—SYN. of 'epithet': title; appellation; adjective.

EPITOME, n. *ĕ-pĭt′ō-mĕ*, [Gr. *epitŏmē*, a surface-incision, an abridgment—from *epi*, upon; *temnō*, I cut; *tŏmē*, a cutting]: a brief summary or abridgment of any book or writing; an abstract or compendium. EPIT′OMIZE, v. *-mīz*, to reduce a work to a small compass; to shorten or abridge by giving the principal matter. EPIT′OMIZING, imp. EPIT′OMIZED, pp. *-mīzed*. EPIT′OMIST, n. *-mĭst*, one who; also EPIT′OMIZER, n.—SYN. of 'epitome': abridgment; compend; synopsis; digest; summary; draft.

EPITRITE, n. *ĕp′ĭ-trīt* [Gr. *epitritos*, containing an integer and a third, $1 \times \frac{1}{3}$ or $\frac{4}{3}$; *epi*, upon; *tritos*, the third]: in *pros.*, a foot consisting of three long syllables and a short one, and denominated first, second, third, or fourth epitrite, according as the short syllable is the first, second, third, or fourth in position, as sălūtāntēs, cōncĭtātī, ĭntērcălāns, ĭncāntārĕ.

EPITROCHOID, n. *ĕp-ĭ-trōk′oyd* [Gr. *epitrochos*, running easily, easily inclined; *epi*, upon; *trochos*, a runner, ball, wheel, or hoop; *eidos*, resemblance]: in *geom.*, curve formed by one circle revolving like a wheel or hoop around the convexity or outer side of the circumference of another

circle. It is akin to the epicycloid, but differs in not having the generating points in the circumference of the revolving circle.

EPITROPE, n. *ĕ-pĭt′ro-pĕ,* or EPIT′ROPY, n. *-pĭ* [Gr *epitropē*, a yielding, a surrender; *epitrepō*, I turn over to another; I yield; I submit; *epi*, over; *trepō*, I turn]: in *rhet.*, concession; figure of speech by which any point is yielded or granted, with a view to obtain an advantage.

EPIZEUXIS, n. *ĕp-ĭ-zūks′ĭs* [Gr. *epizeugnumi*, to fasten on or together; *epi*, upon; *zeugnumi*, to join]: in *rhet.*, figure of speech by which a word is repeated with vehemence or emphasis: as,

> "Alone, alone, all, all, alone,
> Alone on a wide, wide sea."
>
> COLERIDGE: *Ancient Mariner.*

EPIZOON, n. *ĕp′ĭ-zō′ŏn,* EPIZOA, n. plu. *ĕp′ĭ-zō′ă* [Gr. *epi*, upon; *zōŏn*, an animal]: parasitic animal which fastens itself on the exterior of other animals and lives upon them —opposed to *entozoon* (q.v.). Noticing those only that infest man, we may divide them into two groups: (1) Those which live upon the surface of the skin, and (2) those which live in the skin. Fleas, lice, bugs, ticks, etc., belong to the first group; the Itch-insect or *Sarcoptes*, the Pimple-mite or *Demodex folliculorum*, and possibly some other species of the *Acaridæ*, to the second.

In a zoological point of view, all the E. that infest the human subject are Insects or Arachnidans. The parasitic insects are: I. *Pulicida*, or *Fleas*, including—1. The Common Flea, or *Pulex irritans;* 2. The Sand-flea, or *Pulex penetrans*, known also as the Chigo, Chigger, etc. II. *Acanthida*, or *Soft Bugs*, including the common Bed Bug, or *Acanthia* (s. *Cimex*) *lectularia*. III. *Pediculida*, or *Lice*, including—1. The Common Louse, or *Pediculus capitis;* 2. The Body Louse, or *Pediculus vestimenti;* 3. The Crab Louse, or *Pediculus* (s. *Phthirius*) *pubis;* 4. The Louse occurring in Phthiriasis, or *Pediculus tabescentium*.

The parasitic Arachnidans belong to the order of *Acarida*, or Mites; indeed, most of the animals forming the different families of this order lead a parasitic existence. We have— I. *Demodicida*, including the Pimple-mite or *Demodex* (s. *Acarus*) *folliculorum* (the dog and sheep possess each a special demodex). II. *Sarcoptida*, including the Itch-mite, or *Sarcoptes* (s. *Acarus*) *Scabiei*. (Most of our domestic animals seem to be infested by a special sarcoptes, the species of which are numerous.) III. *Ixodida*, or Ticks, including— 1. The American Tick, or *Ixodes hominis* (common in Brazil); 2. The Common Wood-tick (Dogs' Tick), or *Ixodes ricinus*. There are probably many species of Ixodes which are occasionally found on man. IV. *Gamasida*, or Beetle Lice, including—1. The Bird-mite, or *Dermanyssus avium* (occasionally found on sickly persons); 2. The Miana Bug, or *Argas persicus* (common in some parts of Persia, especially at Miana); 3. The Chincha Bug, or *Argas chinche* (occurring in Columbia). V. *Orobatida*, or Grass-lice, including the Harvest-Bug, or *Leptus autumnalis*. See BUG: FLEA: ITCH-

MITE· LOUSE: TICKS. EP'IZOOT'IC, a. *-zō-ŏt'ĭk*, applied to diseases prevailing among animals at the same time, over considerable tracts of country, corresponding to *epidemic* diseases among men. Like epidemics, such diseases appear to depend upon some peculiar and not well ascertained atmospheric causes; where the cases are neglected or overcrowded, they also frequently become contagious; they are apt to take on a low type of fever, and are better treated by supporting than by reducing remedies. Influenza in horses, and pleuropneumonia and vesicular epizootic in cattle, are examples: see CATTLE-PLAGUE: also the references there given. EPIZOOTY, n. *ĕp'ĭ-zō'ŏt-ĭ*, the distemper among horses.

EPLICATE, n. *ĕp'lĭ-kāt* [L. *e*, out, here same as not; *plicatus*, folded, pp. of *plico*, I fold]: in *bot.*, not plaited.

EPOCH, n. *ē'pŏk*, or EPOCHA, n. *ē'pō-kă* [mid. L. *epŏchă* —from Gr. *epŏchē*, a check, a pause in the reckoning of time —from *epi*, upon; *ĕchō*, I hold or have: F. *époque*]: in *chronology*, fixed point of time from which succeeding years are numbered (see CHRONOLOGY); period in the progress of events when some important occurrence takes place; a fixed and important period of novelty or change; in *geol.*, age or era (see ERA); in *astron.*, an abbreviation for 'longitude at the epoch:' it means the mean heliocentric longitude of a planet in its orbit at any given time—the beginning of a century, for instance. The epoch of a planet for a particular year is its mean longitude at mean noon, Jan. 1, when it is leap year, and Dec. 31 of the preceding year, when it is a common year. The epoch is one of the elements of a planet's orbit —SYN. of 'epoch:' date; period; era; time; age; generation.

EPODE, n *ĕp'ōd* [OF. *epode*—from Gr. *epōdŏs*, an after song—from *epi*, upon; *ăĭdō*, I sing]: the third or last part of an ode. It was the last part of the chorus of the ancient Greeks, which they sang after the strophe and antistrophe, when the singers had returned to their original place: it had its peculiar measure of syllables and number of verses: see CHORUS. EPODIC, a. *ĕ-pōd'ĭk*, pertaining to.

EPONYM, n. *ĕp'ō-nĭm* [Gr. *epōnŭmĭă*, a surname—from *epi*, upon; *onŭmà*, a name]: the individual who is assumed as the person from whom any race or tribe took its name. EPONYMOUS, a. *ĕ-pŏn'ĭ-mŭs*, giving one's name to a people, a country, and suchlike; also EPONYMIC, a. *ĕp'ō-nĭm'ĭk*, in same sense. EPON'YMY, n. *-ĭ-mĭ*, the science or study of eponyms.

EPOPEE, n. *ĕp'ō-pē'* [F. *épopée*—from Gr. *epŏpoiĭă*, epic poetry, the writing of it—from *ĕpŏs*, discourse; *poiĭō*, I make]: the history or fable which makes the subject of an epic poem.

EPOS, n. *ĕp'ŏs* [Gr. *epos*, a word, a tale]: an epic poem; the subject or story of an epic poem; epopee.

EPPING, *ĕp'ĭng:* town in the w. of Essex co., England, in a pleasant healthful situation, at the n. end of Epping Forest, 16 m. n.n.e. of London. It has a very irregular appearance. It is noted for its cream, butter, sausages, and

pork, and sends much butter to London. Epping Royal Forest, formerly Waltham Forest, where the ancient kings enjoyed much sport, covered all Essex, and extended almost to London. It is now limited to 60,000 acres in the s.w. part of the county. Of this tract, only 12,000 acres are in wastes and woods, the rest being now enclosed as private property. At the cost of about half a million of pounds, 5,600 acres of E. Forest were secured by the corporation of London, and declared free to the public by the queen, 1882, May. These ten sq. m. of almost unbroken woodland form one of the most extensive and beautiful pleasure-grounds in Europe. In the forest is Queen Elizabeth's hunting-lodge. Separated by a stream from E. Forest is Hainault Forest, lately disforested.—Pop. of E. abt. 3,000.

ÉPROUVETTE, n. *ā′prô-vĕt′* [F.]: a gun, machine, or contrivance of any kind for proving or testing the strength of gunpowder, invented or suggested in the last c. by Robins, and greatly improved by Dr. Hutton.—The *gun* eprouvette determines the strength of gunpowder by the amount of recoil.

The ordinary eprouvette is shaped like a small pistol without a barrel, and having its breech chamber closed by a flat plate connected with a strong spring. On the explosion of the powder against the plate, it is driven back to a distance indexed according to the strength of the powder, and is retained at its extreme state of repulsion by a ratchet wheel.

EPSOM, *ĕp′som* (said to have originally been Ebbasham): small market-town on the margin of the Banstead Downs in Surrey, England, 15 m. s.s.w. of London by road, 14 m. by the London and S.-Western railway. The famed sulphate of magnesia springs of Epsom gave their name to the Epsom Salts formerly manufactured from them. This manufacture has been abandoned from the ease with which these salts can be made artificially from magnesian limestone, or from sea-water. The Royal Medical College, on the Downs, established 1851, provides education for about 170 boys, sons of medical men, and affords a home to decayed members of the profession and their widows. On the Downs, 1½ m. s. of the town, the famous Epsom horse-races are held yearly; said to have been instituted by Charles I., but of greater importance since the institution of the Derby Stakes 1780 (see DERBY DAY). The races last four days, and as many as 100,000 persons often assemble to witness the most important of them.—Pop. 8,417.

EP′SOM SALT, or EPSOMITE, or SUL′PHATE OF MAGNE′SIA ($MgO \times SO_3H_2O$): mineral occurring in the water of mineral springs, as at Epsom, Seidlitz, and many other places; also as an efflorescence on various rocks, sometimes with alum, as at Hurlet, in Renfrewshire; and on the ground, as in some parts of Spain and of the Russian steppes. It is sometimes snow-white and very pure,

sometimes discolored by impurities; and is either in fine thread-like crystals, or in crusts, flakes, granules, etc. Its crystals are prisms, almost rectangular. Chemically it is a hydrous sulphate of magnesium, and may be obtained by the action of dilute sulphuric acid upon magnesian limestone: see MAGNESIUM.

Epson Salt is a well-known purgative in household medicine. It may be given in doses from two drachms to one ounce, according to the effect required, in a tumbler of water.

EPULIS, n. *ĕp′ū-lĭs* or *ē-pū′lĭs* [Gr. *epi*, upon; *oulon*, gum]: a tumor of the gum, often connected with a cariou tooth.

EPULOTIC, a. *ĕp-u-lŏt′ĭk* [Gr. *epoulōtikos*—from *epouloō*, to scar over; *epi*, over; *oulē*, a wound healed over; a scar; *oulos*, whole sound]: tending to heal or cicatrize; cicatrizing: N. a preparation which has the property of healing, drying, or cicatrizing wounds.

EPURÆE, n. *ĕp-ūr-ē′a* [Gr. *epouraios*, on the tail; *epi*, upon; *oura*, tail]: in *entom.*, genus of beetles, family *Nitidulidæ*.

EPWORTH, *ĕp′wėrth:* town in the n.w. of Lincolnshire, England, 30 m. n.n.w. of Lincoln. It consists chiefly of one street, more than 2 m. long. The chief employments are hemp and flax dressing, rope-making, and malting. John Wesley, founder of Methodism, as well as Kilham, founder of the seceding Wesleyans, was born here. Pop. 3,000.

EPWORTH LEAGUE: assoc. of young people connected with the Meth. Episc. Church, organized 1889, May, by forming a union of the various young people's societies of the church then in existence, and named after the birthplace of John Wesley. Its objects are to promote piety among the young members and friends of the church, to aid them in religious development, and to train them practically in works of mercy and help. The movement originated in Cleveland, O., by the union of five societies affiliated with the Methodist Church, who adopted as their motto: 'Look up, Lift up.' It is sustained by voluntary offerings and has headquarters in Chicago, Ill., where its weekly organ, *The Epworth Herald*, is published.

The league grew rapidly in numbers and established itself in foreign lands as well as throughout the United States. There are chapters in Canada, Mexico, South America, Hawaii, Japan, China, Italy, Norway, Denmark, Sweden, and Finland, the total number being nearly 30,000, with over 2,000,000 members.

EPYORNIS: see ÆPYORNIS.

EQUABLE, a. *ĕk′wă-bl* [L. *æquōbĭlĭs*, that may be made equal—from *æquus*, equal: It. *equabile*]: smooth and uniform; even; steady; unruffled. EQ′UABLY, ad. *-blĭ*. EQ′UABIL′ITY, n. *-bĭl′ĭtĭ*, continued equality; equal-

ity in motion; uniformity; evenness; also EQ′UABLENESS, n. *-bl-nĕs.* EQUABLE MOTION, that by which equal spaces are passed over in equal times. EQUAL, a. *ē′kwŏl* [L. *æquālis,* equal]: being of the same magnitude or extent; having the same value; possessed of the same qualities or condition; having the same benefits; in just proportion; not varying, as temper; adequate to: N. one not inferior or superior to another; one of the same age, rank, fortune, etc.: V. to make or to be of the same kind, rank, quality, etc., as another; to answer in full proportion. E′QUALLING or E′QUALING, imp. E′QUALLED or E′QUALED, pp. *-kwŏld.* E′QUALLY, ad. *-lĭ.* EQUALITY, n. *ē-kwŏl′ĭ-tĭ,* similarity or likeness in regard to two things compared; the same condition or dignity; uniformity; evenness (see LIBERTY, EQUALITY, FRATERNITY). E′QUALIZE, v. *-īz,* to make equal. E′QUALIZING, imp. E′QUALIZED, pp. *-īzd.* E′QUALI′ZER, n. *-zĕr,* one who. E′QUALIZA′TION, n. *-ī-zā′shūn,* the act of making equal; the state of being equalized. E′QUALNESS, n. *-nĕs,* state of being equal; evenness.—SYN. of 'equal, a.': equable; uniform; even; level; proportionate; adequate; fair; just; commensurate; equitable; like, alike; plain; fit; balanced; unbiased.

EQUANIMITY, n. *ē′kwă-nĭm′ĭ-tĭ* [L. *æquănĭm′ĭtas,* calmness—from *æquus,* equal; *anĭmus,* mind: It. *equanimita*]: evenness of mind; uniformity of temper.

EQUATION, CHEMICAL; see CHEMISTRY.

EQUATION, n. *ĕ-kwā′shŭn* [F. *équation*—from L. *æquātĭōnem,* equal distribution—from *æquus,* equal—akin to Skr. *ekas,* one]: a making equal; in *alg.,* a proposition asserting the equality of two quantities, having the sign = (equal to) placed between them. EQUATE, v. *ē-kwāt′,* to reduce to an equation; to reduce to mean time or motion. EQUA′TED, a. reduced or corrected, as an astronomical observation. ANNUAL EQUATION, one of the most conspicuous of the subordinate fluctuations in the moon's motion, due to the action of the sun, which increases with its proximity to the earth and her satellite. It consists in an alternate increase and decrease in her longitude, corresponding with the earth's situation in its annual orbit, i.e., to its angular distance from the perihelion, therefore having a year instead of a month, or aliquot part of a month, for its period. For explanation of the mode of its production, see Herschel's *Outlines of Astronomy,* art 738 *et seq.* DIFFERENTIAL EQUATION, equation involving differential coefficients (see CALCULUS); such is $\frac{d^3y}{d^3x}+a\frac{dx}{dy}=x$ from which it is required to find the relation between y and x. The theory of the solution of such equations is an extension of the integral calculus, and is a branch of study of the highest importance. FUNCTIONAL EQUATION: see FUNCTIONS.—LUNAR EQUATION: see LUNAR THEORY.— EQUA′TION OF E′QUINOXES, difference between the true position of the equinoxes, and the position calculated on the supposition that their

motion is uniform: see PRECESSION. EQUATOR, n. *ē-kwā-tėr*, or TERRESTRIAL EQUATOR, the supposed or imaginary great circle which passes round the middle of the earth's surface at an equal distance from both poles, and which divides the earth into north and south hemispheres. CELESTIAL EQUATOR, the great circle in the sky, corresponding to the extension of the equator of the earth. EQUATORIAL, a. *ē′kwă-tō′rĭ-ăl*, pertaining to the equator or regions about it: N. an astronomical telescope. E′QUATO′RIALLY, ad. *-lĭ*. EQUATORIAL CURRENT, the great ocean-current which manifests itself within the equatorial regions of the Atlantic, Pacific, and Indian oceans, having a decided western flow, and warmer by several degrees than the adjacent waters.

EQUATION: indicates the equality of two mathematical expressions. An equation may be transcendental, such as $log\ x=a$, $sin^2x+cos^2x=1$, or it may be algebraical, involving merely algebraical expressions. From another point of view, E. is the expression of the conditions which connect known and unknown quantities. Thus (1), $xy=24$, and (2), $x^2+y^2=52$, are two equations expressing the relations between the unknown quantities x and y and known quantities. Generally, equations are formed from observations from which an object of inquiry may be inferred, but which do not directly touch the object. Thus, suppose we wish to ascertain the lengths of the sides of a rectangular board which we have no means of measuring, and that all the information that we can get respecting it is, that it covers 24 sq. ft., and that the square on its diagonal is 52 sq. ft. From these facts, we can form equations from which we may determine the lengths of the sides. In the first place, we know that its area is equal to the product of its sides, and if we call these x and y, e have $xy=24$, the first of the equations above given. Again, we know that the sum of the squares on the sides is equal to the square on the diagonal; hence, we have the second equation, $x^2+y^2=52$. From these two equations we are able to determine the values of x and y. The determination of these values is called the *solution* of the equations.

Algebraic equations in the form $x^n+a_1x^{n-1}+a_2x^{n-2}+\ldots+a_n=0$ are classified according to the degree of the unknown quantity. Thus, an E. of the first degree, called also a linear or a simple E., is one containing the unknown quantity only to the first degree; e. g., $\frac{x}{2}+3=4$. A quadratic E. contains the unknown quantity in a degree not higher than the second ; e.g., $x^2+5x-36=0$. Cubic, quartic (biquadratic), quintic and sextic equations involve the unknown in the third, fourth, fifth and sixth powers respectively. For the higher equations there are no special names in general use; they are said to be equations of the degree indicated by the highest power of the unknown which they contain. Simultaneous equations involve two or more unknown quantities, and there must always be as many of them, in order that their solution

may be determinate, as there are unknown quantities. The equations first mentioned, viz., $xy=24$, $x^2+y^2=52$, are simultaneous equations. In the course of solving such equations the principal difficulties encountered are always ultimately the same as in the solution of equations containing only one unknown quantity. For instance, in the equations just given, if we substitute in the second the value y as given by the first, or $y=\frac{24}{x}$, we have $x^2+\frac{(24)^2}{x^2}=52$, which may be solved as a quadratic E. The general theory of equations is concerned principally with the solution of equations involving one unknown quantity only, for to this sort all others reduce themselves. Indeterminate equations are such as do not set forth sufficient relations between the unknown quantities for their absolute determination, and which accordingly admit of various solutions. Thus, $xy=24$ is an indeterminate E., which is satisfied by the values $x=12$, $y=2$; or $x=3$, $y=8$; or $x=2$, $y=12$. We require some other relation, such as $x^2+y^2=52$, to enable us to fix on one of the sets of values, x and y, as those of x.

The object of all computation is the determination of numerical values for unknown quantities, by means of the relations which they bear to other quantities already known. The solution of equations or, in other words, the evolution of the unknown quantities involved in them, is an important branch of algebra. This problem resolves itself into two distinct parts: (1) The *algebraic* solution of equations, in which a general algebraic expression must be found which represents all the roots indifferently, (2) the solution of numerical equations by *approximation* to a certain number of decimal places. An algebraic solution must yield accurate expressions for the values of the roots in terms of the coefficients, such expressions to involve no other processes than addition, subtraction, multiplication, division, and the extraction of roots of any orders, and of these operations only a finite number. Roots expressed by an infinite series do not present an *algebraic* solution, since the additions or subtractions are infinite in number. Cardan's formula for the cubic $x^3+3ax+2b=0$, viz. $x=\sqrt[3]{-b+\sqrt{b^2+a^3}}+\sqrt[3]{-b-\sqrt{b^2+a^3}}$ constitutes an algebraic solution, because all operations are of the algebraic kind named above and are finite in number. All three roots are represented by this formula, as appears from the fact that every number has three cube roots. No algebraic solution is possible for general equations higher than the fourth degree, as was first rigorously demonstrated by the Norwegian mathematician Niels Henrik Abel in 1826. For quadratic equations the algebraic solution furnishes an easy method of computing the numerical values of the roots; but in case of the cubic and quartic equation, the formulæ constituting the algebraic solutions are of little value in computation, for the reason that they often involve imaginary expressions in a way that renders actual computation impracti-

uble. Cardan's solution of the cubic, is an expression giving rise to the so-called 'irreducible case,' whenever the roots of the cubic are all real. In that case both a and (b^2+a^3) are negative, $\sqrt{b^2+a^3}$ is imaginary, and we are required to find the cube roots of a complex number $(-b+\sqrt{b^2+a^3})$. But there exists no convenient arithmetical process of doing this. Approximate values may be obtained by expanding the radicals into infinite series, whereupon the imaginary terms disappear by mutually destroying one another. Certain special types of equations, higher than the fourth degree, can be solved by algebra and are called *solvable* or *metacyclic* equations. Such a type are the *cyclic* equations, in which each root can be expressed as a rational function of any other root. If a cylic equation is irreducible, it is called a *normal* equation. Great advances in the study of solvable equations were made by Abel and Galois. While the general algebraic solution of higher equations is impossible, it is always possible to find approximately the roots, whether real or imaginary, of *numerical* equations (i.e., equations with numerical coefficients) of any degree. The most convenient and simple processes are those invented by William George Horner in 1819 and by C. H. Graeffe in 1837. Horner's method is explained in English algebras; for the latter see G. Bauer's *Vorlesungen über Algebra*, 1903, chapt. xxiv. The solution of numerical equations has received the attention of Newton, Lagrange, Budan, Fourier, Horner, Sturm, Graeffe, McClintock, Carvallo, and others.

The rules for the solution of the simpler equations are explained in text-books of algebra. It must suffice to notice here a few of the leading general properties of equations. By the roots of an E. are meant those values, real or imaginary, of the unknown which satisfy the equality; and it is a property of every E. to have as many roots and no more as there are units in its degree. Thus, a quadratic E. has two roots; a cubic E., three; a quartic, four. Every E. of the nth degree can be reduced to the form $f(x)=x^n+a_1x^{n-1}+a_2x^{n-2}+\ldots+a_n=0$.

If its roots are $r_1, r_2, \ldots r_n$, then $f(x)=0$ may be written in the form $(x-r_1)(x-r_2)\ldots(x-r_n)=0$. For instance, the quadratic $x^2-x-6=0$ is, in the factored form, $(x-3)(x+2)=0$ and its roots are $+3$ and -2. The factors are formed thus: If r_1 is a root, then $x=r_1$ and $x-r_1$ is a factor. If $+3$ is a root, then $x-3$ is a factor. If these factors are multiplied out, we easily observe the way in which the coefficients of $f(x)=0$ are formed and the following results appear evident:

a_1 = sum of the roots, with their signs changed,
a_2 = sum of the products of every two roots,
a_3 = sum of the products of every three roots, with their signs changed,

. . . . . .

a_n = product of all the roots, with their signs changed or not, according as n is odd or even.

If, in multiplying a series of such factors, we examine carefully the matter of algebraic signs of the coefficients of the resulting polynomials, we arrive at Descartes' Rule of Signs: An equation has as many positive roots as there are changes of sign from + to — and from — to + in its terms, or fewer by an even number. Thus, the equation $x^5+x^4-x+5=0$ has two changes of signs and, therefore, two positive roots or none. To test for negative roots, transfrom the equation so that the signs of all the roots are changed. To this end, write $-x$ for x, and we have $-x^5+x^4+x+5=0$, an equation with one change in sign and consequently one positive root. It follows from this that the original E. has one negative root. Since the total number of roots is five, at least two roots are imaginary. As the result of this application of Descartes' Rule, we are left in doubt, whether the number of imaginary roots is two or four. That it could not be three follows also from the theorem that in an equation with real coefficients, imaginary roots, if present, occur in pairs. The number of imaginary roots may be odd, if some or all the coefficients are imaginary. Thus $x^2+(2+i)x+2i=0$, where $i=\sqrt{-1}$, has one imaginary root $-i$ and one real root —2. There is a theorem, due to Sturm, which excels Descartes' Rule of Signs by determining invariably the exact number of imaginary roots, as well as of positive and negative roots of an equation with real coefficients, but it labors under the disadvantage of being very laborious in its application.

On the theory of equations, consult Burnside and Panton, *Theory of Equations;* Cajori, *Introduction to the Modern Theory of Equations;* Dickson, *Theory of Algebraic Equations;* H. Weber, *Lehrbuch der Algebra.*

EQUATION, Personal: in Astronomy, the correction of errors in recording the results of observations of an identical event by two or more observers. The errors most likely to occur are in the time-records of an event, some observers recording it a few seconds before its actuality, others shortly afterward. As the work of regular observers is too valuable to be discarded, their records may be utilized in computations when the amount of their average personal errors has been ascertained; and this is done by carefully examining a reasonable number of records of the same event or events by two or more observers, and indicating the average difference between their records.

EQUA'TION OF LIGHT: in astronomical observations, the allowance to be made for the *time* occupied by the light in traversing a variable space. The visual ray by which we see any body is not that which it emits at the moment of our seeing it, but that which it *did* emit some time before, viz., the time occupied by light in traversing the space which separates it from us. If, then, the body be in motion, its aberration, as due to the earth's velocity, must be applied as a correction, not to the line joining the earth's place at the moment of observation

with that occupied by the body (as seen) at the same moment, but at that antecedent moment when the ray quitted it. Hence is derived a rule applied by astronomers for the rectification of observations made on a moving body, viz., from the known laws of its motion and the earth's, calculate its relative angular motion in the time taken by light to pass from it to the earth. This motion is the total amount of its apparent displacement. Its effect is to displace the body in a direction contrary to its apparent motion, an effect one part of which is due to aberration, properly so called (see ABERRATION), resulting from the composition of the motions of the earth and of light, and another part to the fact of the passage of light occupying time.

EQUATION OF PAYMENTS: arithmetical problem —to find a time when, if a sum of money be paid by a debtor, which is equal to the sum of several debts payable by him at different times, no loss will be sustained by either the debtor or creditor. The rule generally given is as follows: Multiply each sum due by the time at which it is payable, and then divide the sum of the products by the sum of the debts: the quotient is the equated time. For example, if £10 be due at one month, and £20 at two months, find as an equivalent when the whole £30 may be paid at once. Ans. $\frac{10\times1+20\times2}{30}=1\frac{2}{3}$ months. This rule, however, is incorrect where the debts are unequal, because it takes no account of the balance of interest and discount. A correct rule for the case of two debts and simple interest is subjoined. Let d and D denote the debts, t and T the times of payment, and r one year's interest on D. Then if $A=T+t+\frac{D+d}{dr}$ and $B=T\,t+\frac{DT+dt}{dr}$, the equated time will $=\frac{1}{2}A-\frac{1}{2}\sqrt{(A^2-4B)}$. When three or more debts are concerned, the plan is to find by this formula the equated time for the first two, and then for their sum payable at their equated time, and the third, and so on. The common rule is, however, sufficiently correct for ordinary use.

EQUA'TION OF THE CENTRE: addition or subtraction of the quantity by which the true and the mean longitude of the earth differ. If the earth moved uniformly round the sun in a circle, it would be easy to calculate its longitude or distance from the line of equinoxes at any time. One year would be to the time since the vernal equinox as 360° to the arc of longitude passed over. But the orbit of the earth is not circular, nor is its motion uniform; the orbit is slightly elliptical, and the motion is quicker at perihelion than at aphelion, The true rule, then, for ascertaining the earth's longitude is contained in the following proportion: one year is to the time elapsed as the whole area of the earth's orbit is to the area swept

over by the radius vector in the time. This is a deduction from Kepler's law (see CENTRAL FORCES), that, in planetary motion, equal areas (not *angles*) are swept over in equal times. The area swept over being ascertained from the laws of the earth's motion, and the elements of its orbit, it is a question of geometry to ascertain the *angle* corresponding to the area, or the true longitude. In astronomy, the longitude, as calculated on the supposition that the earth moves uniformly in a circle, is called the *mean* longitude of the earth; and it happens, from the orbit being but slightly different from a circle, that the mean and true longitude differ but slightly. By the *equation of the centre*, this difference is sometimes to be added to, sometimes to be subtracted from, the mean longitude, to obtain the true; and sometimes it is zero.

EQUA'TION OF TIME: addition or subtraction of the difference between apparent and mean time. Under EQUATION OF THE CENTRE (q.v.) it is noted that the earth's motion in the ecliptic—or what is the same, the sun's apparent motion in longitude—is not uniform. This want of uniformity would of itself obviously cause an irregularity in the time of the sun's coming to the meridian on successive days; but besides this want of uniformity in the sun's apparent motion in the ecliptic, there is another cause of inequality in the time of its coming on the meridian—viz., the obliquity of the ecliptic to the equinoctial. Even if the sun moved in the equinoctial, there would be an inequality in this respect, owing to its want of uniform motion; and even if it moved uniformly in the ecliptic, there would be such an inequality, owing to the obliquity of its orbit to the equinoctial. These two independent causes jointly produce the inequality in the time of its appearance on the meridian, the correction for which is the equation of time.

When the sun's centre comes to the meridian, it is apparent noon, and if it moved uniformly on the equinoctial, this would always coincide with *mean noon*, or 12 o'clock on a good solar clock. But from the causes above explained, mean and apparent noon differ, the latter taking place sometimes as much as $16\frac{1}{2}$ minutes before the former, and at others as much as $14\frac{1}{2}$ minutes after. The difference for any day (called the equation of time) is stated in ephemerides for every day of the year. It is nothing or zero at four different times in the year, at which the whole mean and unequal motions exactly agree—viz., about Apr. 15, June 15, Aug. 31, and Dec. 24. At all other times, the sun is either too fast or too slow for clock-time. In the ephemerides above referred to, the sign + or — is prefixed to the equation of time, according as it is to be added to or subtracted from the apparent time to give the mean time: see NAUTICAL ALMANAC.

EQUATOR: an imaginary great circle of the celestial vault or on the surface of the earth. As used in astronomy the term signifies a great circle of the celestial vault at

right angles to its axis, and dividing it into a northern and a southern hemisphere. It is constituted by the plane of the earth's equator, produced in every direction till it reaches the concave of the celestial sphere. The sun is twice a year in the celestial equator—namely, at the equinoxes, whence the equator is also known as the equinoctial line, or simply the equinoctial (see EQUINOX). The point in the equator which touches the meridian is raised above the true horizon by an arc which is the complement of the latitude. The sun and planets all have equators. They rotate around their several axes, and the plane at right angles in each case is the equator of the heavenly body. In geography, the equator is a great circle on the surface of the earth equidistant from its poles, and dividing it into two hemispheres. Its latitude is zero; it is therefore marked on maps as 0. Other parallels of latitude are counted from it, augmenting in their numerical designation as their distance from it north or south increases, the poles being 90°. The plane of the terrestrial equator is a plane perpendicular to the earth's axis and passing through its centre. The magnetic equator is a somewhat irregular line, nearly but not quite a great circle of the earth, in which there is no dip of the magnetic needle. It is hence called also the aclinic line. It is inclined to the horizon at an angle of 12°, and cuts it at two points almost exactly opposite to each other, the one in the Atlantic and the other in the Pacific. It is not far from the geographical equator, but its situation slowly alters year by year, there being a slow oscillation of the magnetic poles, while the geographical equator and poles are fixed.

EQUATO'RIAL 'of the equator:' a geographical and astronomical term. In astronomy it is usually applied to a telescope so mounted as to have a motion in two planes at right angles to each other; one parallel to the axis of the earth, and the other to the equator. Each axis has a graduated circle, one for measuring declination and the other right ascension. Clockwork is sometimes attached to the instrument to give the motion in right ascension, and thereby keep the object constantly in the field of the instrument.

EQUERRY, n. *ĕk'wĕr-ĭ*, also spelled EQ'UERY [F. *écurie*, a stable—from OF. *escuyer*, a squire who attended on a knight, part of whose duties was to look after his master's horse—from mid. L. *scūrĭă*, stables, a barn: O. H.G. *scura*, an outhouse: F. *escuyrie*, a squire's place]: an officer in a prince's household who has the care of the horses, and attends him in public.

EQUESTRIAN, a. *ĕ-kwĕs'trĭ-ăn* [L. *equestrĭs*, belonging to horsemen—from *equēs*, a horseman: F. *équestre*]: pertaining to horses or horsemanship; being on horseback; denoting an order of ancient Roman knights called *Equites*: N. a skilful rider on horseback. EQUES'TRIANISM, n. *-ăn-ĭzm*, skilful or professional riding on horseback; the

art or recreation of riding (see HORSEMANSHIP). EQUESTRIAN STATUE, representation of a man on horse back. Equestrian statues were awarded a high honor to military commanders and persons of distinction in Rome, and latterly were, for the most part, restricted to the emperors, the most famous in existence being that of Emperor Marcus Aurelius, now in the Piazza of the Capitol at Rome. It is the only ancient equestrian statue in bronze that has been preserved; an exemption which it probably owed to the fact that for centuries it was supposed to be a statue of Constantine. The action of the horse is so fine, and the air of motion so successfully given to it, that Michael Angelo is said to have called out to it 'Cammina!' —(Go on, then!) It was originally gilded, and traces of the gilding are still visible on the horse's head. So highly is this statue prized, not only for its artistic but its historical value, that an officer used regularly to be appointed by the Roman govt. to take care of it, under the designation of the Custode del Cavallo. On the occasion of the rejoicings by which Rienzi's elevation to the tribuneship was celebrated 1347, wine was made to run out of one nostril and water out of the other of this famous horse. The statue then stood in front of the Church of St. John Lateran, near to which it was found, and a bunch of flowers has always been presented annually to the chapter of that basilica, in acknowledgment of ownership, since it was removed to its present site on the capitol. All European capitals are adorned, or disfigured, by numerous equestrian statues, London belonging pre-eminently to the latter category. They are seen also in some cities of the United States.

EQUES'TRIAN ORDER, or EQUITES, *ĕk'wĭ-tēz:* originally the cavalry of the Roman army; said to have been instituted by Romulus, who selected from the three principal Roman tribes 300 equites. This number was afterward gradually increased to 3,600, partly of patrician, partly of plebeian rank, required to possess a certain amount of property. Each of these equites received a horse from the state; but about B.C. 403, a new body of equites began to appear, who were obliged to furnish a horse at their own expense. These were probably wealthy *novi homines*, men of equestrian fortune, but not descended from the old equites (for it should be observed that the equestrian dignity was hereditary). Until B.C. 123, the equites were exclusively a military body; but in that year Caius Gracchus carried a measure, by which all the *judices* had to be selected from them. Now, for the first time, they became a distinct order or class in the state, and were called *Ordo Equestris*. In B.C. 70, Sulla deprived them of this privilege; but their power did not then decrease, as the forming of the public revenues appears to have fallen into their hands. After the conspiracy of Catiline, the Equestrian Order, which on that memorable occasion had vigorously supported the Consul Cicero, began to be looked upon as a third estate

in the Republic; and to the title of *Senatus Populusque Romanus* was added *et Equestris Ordo*. But, even in the beginning of the empire, the honor, like many others, was so indiscriminately and profusely conferred, that it fell into contempt, and the body gradually became extinct. As early as the later wars of the Republic, the equites had ceased to constitute the common soldiers of the Roman cavalry, and figure only as officers.

EQUI, *ē′kwĭ* [L. *æquus*, equal]: a prefix meaning equal, alike—as, EQUILATERAL, equal-sided. EQUIVALVED, having both valves alike. *Note.*—The words of which *equi* forms the prefix are mostly self-explanatory.

EQUIANGULAR, a. *ē′kwĭ-ăng′gū-lėr* [L. *æquus*, equal; *angulus*, a corner or angle]: having equal angles. A figure is said to be equiangular all whose angles are equal to one another, as a square, or any regular polygon. Also triangles and other figures, whose corresponding angles are equal, are said to be equiangular one with another.

EQUIDÆ, *ĕk′wĭ-dē* or *ē′kwĭ-dē* (or *Solidungula*): family of mammalia of the order *Ungulata*, sub-order *Perissodactyla;* containing only a small number of species, which so nearly resemble each other that almost all naturalists agree in referring them to one genus, *Equus*. They are distinguished from all other quadrupeds by the complete consolidation of the bones of the toes, or the extraordinary development of one toe alone in each foot, with only one set of phalangeal and of metacarpal or metatarsal bones, and the extremity covered by a single undivided hoof. There are, however, two small protuberances (*splint bones*) on each side of the metacarpal or metatarsal bone (*canon* or *cannon bone*), which represent other toes. The equidæ have six incisors in each jaw, and six molars on each side in each jaw; the males have also two small canine teeth in the upper jaw, sometimes in both jaws, which are almost always wanting in the females. The molars of the equidæ have square crowns, and are marked by laminæ of enamel with ridges forming four crescents. There is a wide space between the canine teeth and the molars. The stomach of the equidæ is simple, but the intestines are long, and the cæcum extremely large; the digestive organs being thus very different from those of the ruminants, but exhibiting an equally perfect adaptation to the same kind of not easily assimilated food. Another distinctive peculiarity of the equidæ is, that the females have two teats situated on the pubes, between the thighs. But notwithstanding these characters, so dissimilar to those of the ruminants, they approach them very much in their general conformation, and may be regarded as a connecting link between pachyderms and ruminants. The largely devloped and flexible upper lip is a character which belongs to the former rather than to the latter order.

The equidæ are now found in a truly wild state only in Asia and Africa. Fossil remains exist in the newer geological formations in great abundance in many parts of

the old world; very sparingly, however, in the new, though the bones of a peculiar and distinct species (*Equus curvidens*), belonging to the Pleiocene period, have been found in S. America.

The horse and the ass are by far the most important species of this family. The dziggethai also has been domesticated and made useful to man. Of the other species, the zebra, quagga, and dauw, it is generally believed that they are incapable of useful domestication. Equus, *ē'kwŭs*, n. genus of ungulates, typical of the family *Equidæ*.

EQUIDIFFERENT, a. *ē'kwĭ-dĭf'fėr-ĕnt* [L. *æquus*, and *different*]: arithmetically proportional.

EQUIDISTANT, a. *ē'kwĭ-dĭs'tănt* [L. *æquus*, equal; *distans* or *distan'tem*, far asunder]: at an equal distance from some point or place. E'quidis'tance, n. E'quidis'tantly, ad. *-lĭ*.

EQUILATERAL, a. *ē'kwĭ-lăt'ėr-ăl* [L. *æquus*, equal; *lătus*, a side]: having all the sides equal. A square is equilateral. The equilateral hyperbola is that whose axes and conjugate diameters are equal.

EQUILIBRATE, v. *ē'kwĭ-lī'brāt* [L. *æquus*, equal; *librātus*, weighed, balanced]: to balance equally two scales, sides, or ends.

EQUILIBRIUM, n. *ē'kwĭ lĭb'rĭ-ŭm* [L. *æquĭlibrĭŭm*, a horizontal position—from *æquus*, equal; *lībră*, a balance]: equality of weight, power, or force, etc.; the state of rest or balance of a body or system, solid or fluid, resulting from the action of two opposite and equal forces, or of various forces: see Statics: Hydrostatics.

EQUILIBRIUM, CHEMICAL. In mechanics a system is said to be in equilibrium when the forces that act upon it are precisely balanced, to that their resultant is everywhere zero. A system is similarly said to be in chemical equilibrium when its state is such that there is no tendency toward a sensible chemical change, in any of its parts. The absence of chemical action may be absolute, or merely apparent. In other words, there may be no chemical changes going on at all, or there may be opposite changes going on simultaneously, in such a way that no resultant modification can be observed in any part of the system, however small the part selected for observation may be. In the latter case the existence of the simultaneous and opposite reactions can only be indirectly inferred from a study of the system when it is not in equilibrium.

EQUIMULTIPLE, n. *ē'kwĭ-mŭl'tĭ-pl* [L. *æquus*, equal, and *multiple*]: a number which has been multiplied by the same number or quantity as another: Adj. multiplied by the same number or quantity.

EQUINE, a. *ē'kwīn*, or Equinal, a. *ē-kwī'năl* [L. *equīnŭs*, pertaining to horses—from *equus*, a horse: It. *equino*]: pertaining to horses.

EQUINIA, *ē-kwĭn'ĭ-a*, or Glanders, in the Human Sub-

ject: disease affecting man, to whom it is transmissible from the lower animals. It is remarkable that though the disease in the horse and ass has been recognized from the time of Aristotle (who describes it as common in the ass), it was not till 1810 that Waldinger of Vienna drew attention to the fact, that special precautions should be taken in the dissection of the horses affected with glanders and farcy, inasmuch as the most serious and often fatal consequences might arise from the inoculation of the morbid matter. Strangely, however, he does not seem to have noticed that the disease thus induced in man is identical with that of the horse; and it was not till 1821 that Schilling recognized this important point.

In the great majority of cases, the transmission is from the horse, the ass, or the mule to man; but several instances have been recorded in which it has been transmitted from one human being to another. The disease is no doubt generally due to inoculation with matter containing the pathogenric germ, called *Bacillus mallei*, but the virus is probably capable also of being absorbed by unbroken mucous membrane. Most of the recorded cases have occurred in men of good constitution and in the prime of life. The four varieties of this disease which occur in the horse have been observed in man—viz., (1) Acute Glanders, (2) Chronic Glanders, (3) Acute Farcy, (4) Chronic Farcy.

Acute Glanders is the commonest form. The period of inoculation ranges, in the majority of cases, from three days to a week. If there is a distinct wound or abrasion through which the poison has been absorbed, the parts around the broken surface become red, tense, and painful, often before the appearance of any of the constitutional symptoms, such as a general feeling of illness, great depression of the spirits, headache, rigors, increased rapidity of the pulse, and pain in the joints. A characteristic pustular eruption, often accompanied by bullæ or blebs, appears on the face and limbs; and abscesses frequently occur on the face and about the principal joints. A yellow, purulent, fetid discharge, often mixed with blood, exudes from the nasal mucous membrane, which is invariably the seat of a pustular eruption, or of ulcerations. The prostration observable from the beginning increases during the disease. The pulse becomes weak and frequent, the breathing difficult, the voice feeble, and the bowels very relaxed, the stools being extremely fetid. Delirium now sets in, which is followed by coma and death. Death usually occurs about the end of the second week, but the duration of the disease has been known to vary from 3 to 59 days. *Chronic Glanders* is so rare an affection in man that it hardly requires notice. The course of the disease usually extends over several months, and only one case of recovery is reported.—*Acute Farcy* seems to differ essentially from acute glanders only in the fact of there being no affection in the mucous membrane of the nostrils. The cutaneous eruption may or may not be present; in most cases, it

is present, and the disease then follows exactly the same course as glanders. When there is no eruption, there is merely an inflammation of the lymphatic vessels and glands, or *adenitis* and *angeioleucitis* (q.v.), accompanied with the formation of soft subcutaneous tumors at various parts. This form of the disease often terminates favorably, or may merge into *Chronic Farcy,* which is characterized by the formation of an abscess on the forehead or elsewhere, succeeded by indolent and fluctuating tumors, which follow one another in various parts of the body, open spontaneously, and form very intractable ulcers. The disease usually runs its course in about a year.

The treatment is partly surgical in the excision of the original site of infection, incision of the tumors (the farcy buds) and cleaning out of their contents; and partly medical in the giving of tonics and sustaining remedies. The nose should be washed out with antiseptic solutions.

EQUINOX, n. *ē′kwĭ-nŏks* [L. *æquĭnoctĭŭm,* the equinox —from *æquus,* equal; *nox,* night; *noctes,* nights]: the time when the sun enters on the equinoctial line—the sun rising higher in the heavens every day at noon till the point (equinoctial) is reached when the days and nights are of equal length all over the world, making what is called the *vernal* or *spring equinox,* about March 21; when the same point is reached in descending, the sun makes what is called the *autumnal equinox,* about Sep. 23. At the vernal equinox, the sun is passing from s. to n., and in the n. hemisphere the days are lengthening; at the autumnal, he is passing from n. to s. and the days are shortening. As the earth moves more rapidly when near the sun, or in winter, the sun's apparent motion is not uniform, and it happens that he takes eight days more to pass from the vernal to the autumnal equinox than from latter to the former. The equinoctial points are not stationary. Sometimes they are called the equinoxes, but commonly by equinoxes is meant the time when the sun enters those points. See Ecliptic. E′quinoc′tial, a. *-nŏk′shăl,* pertaining to the equinoxes and the regions under the equinoctial; designating an equal length of day and night; occurring at the time of the equinoxes, as the *equinoctial gales:* N. the celestial equator (see Equator, Celestial), the great circle of the celestial concave which divides the heavens into the n. and s. hemispheres, and which derives its name from the phenomenon that at all places on the earth's surface beneath this circle, the nights are equal all the year round, being of the constant length of 12 hours, the sun setting at 6 P.M. and rising at 6 A.M.; the circle in the heavens which the sun appears to describe when the days and nights are of equal length. Equinoctial points, those in which the equinoctial and the ecliptic intersect (see Ecliptic); sometimes called the equinoxes (see Equinox). Equinoctial time, time reckoned from the instant when the point of Aries passes the Vernal Equinox (see Equinox): this instant is selected as a convenient central point for a uniform reckoning of time by astronomical observers. E′quinoc′tially, ad. *-lĭ.*

EQUIP, v. *ĕ-kwĭp′* [F. *équiper*, to acconter: Icel. *skipa*, to arrange: AS. *sceapan*, to form: Ger. *schaffen*, to create, to provide]: to fit out; to furnish with whatever is necessary. EQUIP′PING, imp. EQUIPPED′, pp. *-kwĭpt′*. EQUIP′MENT, n. [F. *équipement*]: all necessary articles or furnishings as for an expedition or voyage. EQUIPAGE, n. *ĕk′wĭ-pāj* [F. *équipage*]: the carriages, horses, liveried servants, etc., of a gentleman, nobleman, or prince; the furniture and necessaries of an army or ship of war, etc. EQ′UIPAGED, a. *-pājd*, furnished with an equipage.—*Equipment*, *Equipage*, in *military matters*, names of certain of the necessaries for officers and soldiers, comprising horses, horse-appointments, baggage, saddlery, accouterments, etc. The equipment of a private soldier is often used as a name for the whole of his clothes, arms, and accouterments collectively. The *equipage* of an army is of two kinds: it includes all the furniture of the camp, such as tents and utensils, under the name of *camp-equipage;* while *field-equipage* comprises saddle-horses, baggage-horses, and baggage-wagons.—BUREAU OF EQUIPMENT AND RECRUTING, in the U. S. navy, department for supplying vessels with all articles necessary for a voyage, such as rigging, sails, and anchors, charged also with the recruiting service.

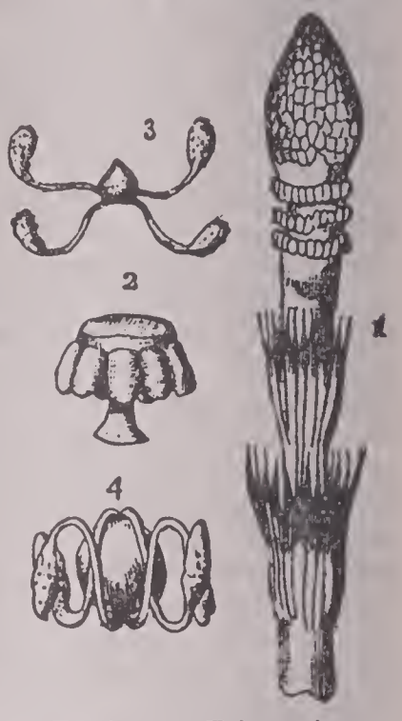
EQUIPOISE, n. *ē′kwĭ-poyz* [L. *æquus*, equal: F. *poids*, weight]: equality of weight; equilibrium.

EQUIPOLLENT a. *ē′kwĭ-pol′lĕnt* [L. *æquus*, equal; *pollen′tem*, being able: F. *équipollent*]: having equal power, strength, or force; equivalent. E′QUIPOL′LENCE, n. *-lĕns*, or E′QUIPOL′LENCY, n. *-lĕn-sĭ*, ability, power, or force in the same degree.

EQUIPONDERANT, a. *ē′kwĭ-pŏn′dĕr-ănt* [L. *æquus*, equal; *pondus*, weight; *ponděris*, of weight]: being of the same weight. E′QUIPON′DERANCE, n. *-ăns*, equality of weight; equipoise.

EQUISETACEÆ. plu., n *ĕk′wĭ-sē-tā′sĭ-ē*, or EQUISETUMS, n. plu. *ĕk′wĭ-sē′tŭms* [L. *equĭsētis*, the plant horse-tail—from *equus*, a horse; *sētă*, a thick stiff hair or bristle]: an extensive order of marsh or boggy cryptogamic plants, represented by the common *horse-tail*. EQ′UISE′TITES, n. plu. *-sē′tītz*, in *geol.*, fossil plants, resembling the equisetum of our pools and marshes. EQUISETIC, a. *ĕk′wĭ-sĕt′ĭk*, obtained from the equisetums. EQUISETUM, genus of cryptogamous plants, the structure and affinities of which are not yet well understood, but which many botanists regard as constituting a suborder of ferns, while others prefer to make it a distinct order, *Equisetaceæ*. The English name HORSE-TAIL is often given to all the species. They have a leafless, cylindrical, hollow, and jointed stem, each joint terminating in a membranous and toothed sheath, which incloses the base of the one above it. The fructification is at the summit of the stem in spikes, which somewhat resembles trobiles (cones), and are formed of scales bearing spore-cases on their lower surface.

The spores are minute, oval, or round, green, and each accompanied with four elastic and hygrometrical threads. These threads are sometimes called *elaters*, but it is by no means certain that they are of the same nature with the spiral filaments so called, which are mixed with the spores of many *Hepaticæ* (q.v.). Each thread terminates in a kind of club. The stems generally have lateral branches, angular, but otherwise similar in structure to the stem, growing in whorls from the joints; sometimes the stem is simple; or fertile stems are simple, and sterile stems are branched. The species of this genus contain a peculiar acid, called *Equisetic Acid*. Astringent and diuretic properties exist in these plants, and they were formerly used in medicine, but are not now regarded as of much value. It has been said that they are very injurious to cattle which eat them, but this lacks confirmation. They abound chiefly in damp soils, and sometimes so much that the plow and harrow, or the grubber, must be employed to extirpate them. Some, however, grow in dry fields and gardens; while others are found chiefly in ditches or the banks of rivers. They exist in almost all parts of the world, and are seldom large, varying from a few inches to a few ft. in height, but a comparatively gigantic species has recently been discovered in tropical America. The rough siliceous stems of some species are used for smoothing and polishing wood, particularly those of *E. hyemale*, which are exported in considerable quantities from Holland, under the name of Dutch Rushes. The stems of this species are unbranched, or a little branched only at the base. It is not uncommon in Britain, and is found also, rather sparingly, in N. America. It has been proposed to cultivate it, as it grows well under trees, where few other plants would thrive. The stems of other species, as *E. arvense*, are used for scouring tin and pewter vessels.



Equisetum Telmateia:

1. summit of fertile stems with fructification; 2, a scale, with its stalk (lateral view); 3, a spore, with its filaments unrolled; 4, a spore, with its filaments hygrometrically rolled up.

EQUITABLE, a. *ĕk′wĭ-tă-bl* [F. *équitable*—from L. *æquĭtātem*, justice—from *æquus*, equal]: fair; just; giving equal justice; doing justice; impartial. Eq′uitably, ad. *-blĭ*. Eq′uitableness, n. *-bl-nĕs*, the quality of being just; state of doing justice. Eq′uity, n. *-tĭ* [F. *équité*, equity—from L. *æquĭtātem*]: impartial distribution of justice; just regard to right or claim; the supplying of the defects in law by judging according to reason and justice.

EQUITABLE DEFENSE at common law, one among certain legal defenses applicable equally to courts of equity and common law. A good example of these is the statute of limitations, whereby claims are outlawed after a lapse of years. But there are particular defenses peculiar to courts of equity. One of these is 'founded upon the mere lapse of time and the staleness of the claim in cases where no statute of limitations governs the case' (Story *Eq. Jur.* § 1520) Other peculiar equitable defenses are, part performance of a parol contract, respecting lands, as against the statute of frauds; account stated; plea of a purchase for a valuable consideration without notice; and want of proper parties to a bill. These defenses were either unknown at common law or were not applied except within rigorously narrow and technical limits. In many of the American states, equitable and legal defenses may be united. EQUITABLE ESTATE, right, title, or interest in property, real or personal, distinct from the *legal* estate. In the eye of the law the *legal* owner has the direct and absolute dominion over the property, but the equitable owner, also styled the 'beneficiary' or '*cestui que trust*' is entitled to the avails and income arising therefrom. The rights of owners of equitable estates are enforceable in courts of equity. The relation between the legal owner and the owner of the equitable estate constitutes what is known in law as a 'trust.' See USES: TRUST.—EQUITABLE MORTGAGE, mortgage of an equitable interest in an estate. The underlying idea of a mortgage is a transaction intended as a security for the payment of money or the doing of some specified act. Usually it takes the form of a conveyance of property to be held as the security until the condition is fulfilled. Cases arise, however, in which, though there are no conveyances of property, it is necessary, for the purpose of doing justice to imply liens in the nature of mortgages denominated 'equitable mortgages.' They are construed from the relations or contracts of the parties. A modern writer (Thomas on Mortgages) thus defines these liens: 'Equitable mortgages are simply securities by which no legal interest in the property mortgaged passes to the creditor, and thus include those transactions in which property, or the evidences of property, come into the hands of the creditor, upon a written or verbal, expressed or implied, agreement that such property shall be answerable for the debt, as well as those transactions in which the intention or duty of creating a charge on property is held to arise from an express or implied contract to render that property liable.' A familiar method in England of creating such liens is by the deposit of title deeds to real estate as a security for the loan of money. In consequence of statutes almost universally prevailing in this country requiring mortages of real estate to be recorded if intended to operate as to third parties, the mode of creating equitable mortgages by deposit of title deeds is not recognized to any great extent. The

cases in the United States in which equitable mortgages upon lands have been most frequently sustained, are those in which agreements were made to give a lien but the instruments were defectively or imperfectly executed, or where the parties intending to create a lien have used inapt words for that purpose, or where deeds of real estate absolute on their face, yet contained a reservation in favor of the grantor or some third party. Closely analogous, though perhaps not strictly partaking of the nature of a mortgage, is the lien of a seller of real estate for unpaid purchase money. The remedy of the holder of an equitable mortgage is a suit in equity to enforce the same by a sale of the land. See also MORTGAGE: ESTATE. COURT OF EQUITY, a tribunal, distinct from the common law courts of the country, in which justice is administered by a separate body of rules created and sustained on the strength of precedents or usage; or in which cases are decided according to reason and justice, when they appear to be excepted from the general provisions of the law: see CHANCERY.—SYN, of 'equitable': honest; candid; reasonable; right; upright.

EQUITANT, a. *ĕk'wĭ-tănt* [L. *equĭtan'tĕm*, riding—from *equēs*, a horseman]: in *bot.*, applied to a form of vernation, in which the leaves are folded forward longitudinally on the mid-rib, so that their edges meet, and each embraces the one which is placed next within it; folded leaves when each successively embraces only one-half of the next, are said to be *half-equitant.*

EQUITATION, n. *ĕk'wĭ-tā'shŭn* [F. *équitation*, horsemanship—from L. *equĭtātĭōnem*—from *equēs*, a horseman]: the act or art of riding on horseback; horsemanship.

EQUITES: see under EQUESTRIAN.

EQUITY: see under EQUITABLE.

EQUITY, COURTS OF: a department in judicial administration (see EQUITY, PRINCIPLES OF); formerly recognized in England by separate courts—which separation was inherited by the British colonies, but is now largely discarded in the United States. The administration of justice in England formerly embraced two great branches, known as common law and equity. Speaking generally, it may be said that equity is partly corrective of the common law, partly supplementary of it; and from this it follows that, in an almost endless variety of matters, the decision of a court would vary according as it was a court of equity or a court of common law; the equity courts giving remedies in cases where the common law—though it may acknowledge a hardship—sees no wrong; and acknowledging and enforcing rights which the common law does not admit. The anomaly of keeping up two sets of courts, acting on different principles, the one to do justice where the traditions of the others prevent it from doing justice, or its rules require it to do injustice, had long been perceived; it had been found, too, that this arrangement was inconvenient as well as anomalous.

After attempts at gradual fusion of the conflicting systems by clothing the common-law courts to some extent with the power of resorting to the remedies and admitting the principles employed in the courts of equity, legislative provision was made 1873 for completely revolutionizing the judicial system of England, with a view to a riddance, at one stroke, of its inconvenient and anomalous double system of courts. This was done by the Judicature Act, which was modified 1874–5, and all came into force 1875, Nov. 1 (see COMMON LAW, COURTS OF). The Judicature Act merged the existing courts both of equity and common law in one supreme court of judicature, which consisted of a high court of justice in five divisions (now three), all of them courts of first instance. There was an appeal in a few cases to the privy council; and in the other cases to the court of appeal, and then to the house of lords. In the high court there is now a chancery division, before which, at first, the greater part of the equity business requires to be brought; and it is expressly provided that where the rules of the common law conflict with those of equity, every court is to give effect to the latter. The conflict between common law and equity thenceforth ceased; but as the sources from which the law is and will be derived, they will still be referred to.

The origin of a separate equitable jurisdiction in England is found in the early adoption by the courts of common law of certain set forms for the redress of grievances, and their refusal to apply any remedy to cases which did not fall within those limits. Suitors finding that in numerous cases redress was not to be obtained in the ordinary legal tribunals, had recourse to the king as the fountain of justice, who, sitting in council, heard the complaints upon their merits without reference to the technicalities of law. As early as the reign of Edward I., the practice began to be adopted of delegating to the chancellor (q.v.) the petitions referred to the king. In this reign, an attempt was made to devise a method whereby the common-law courts should be made the sole tribunal for the redress of grievances. By the statute of Westminster the second (13 Edw. I, c. 24), it was enacted that whenever a case occurred requiring a new writ, the chancery (in which all suits took their rise) should frame a new writ to suit the case. This statute was never acted upon to the purpose intended; but in the reign of Edward III. its provisions were made use of by John Waltham, then chancellor, to introduce the writ of *Subpœna* (q.v.) returnable to chancery only, whereby the lord chancellor's court was made the forum of a large class of causes. 'From this time,' says Mr. Spence (*Chancery Jurisdiction*, i 338), 'suits by petition or bill without any preliminary writ became a common course of procedure before the chancellor, as it had been in the council. On the petition or bill being presented, if the case called for extraordinary interference, a writ was issued by the command of the chancellor, but in the name of the king, by

which the party complained against was summoned to appear before the court of chancery, to answer the complaint and abide by the order of the court.' Thus was introduced into chancery the practice of examining upon oath the party in the cause, a practice unknown at that time to common law. The cases heard in the chancery courts were decided upon the principles of *honesty, equity,* and *conscience.* The next step which tended to widen the equitable jurisdiction of the chancery courts, was the exclusion of the Roman law from the courts of common law. This was effected by a prohibition of the judges in the reign of Richard II. One result of this prohibition was to exclude altogether from the common-law courts the question of trusts. The court of chancery at once proceeded to give a remedy in this class of cases, which has ever since formed the most important branch of the equitable jurisdiction of that court. The equitable jurisdiction of the court of chancery in matters of fraud is to be traced to the abolition of the star chamber (q.v.) in the reign of Charles I. This sprung up in England jurisdiction of the court of chancery as a court of equity. It is not, however, to be supposed that the system administered in courts of equity is an arbitrary one at the pleasure of the presiding judge. Such probably was the case on the first introduction of the equity jurisdiction; but as time passed, the decisions of previous judges formed precedents for their successors, and the precepts of the Roman law were much imitated as a code for the regulation of the courts. Now, all the judges acknowledge the authority of decided cases—of the practice of the court—quite as fully as did courts of common law, and though new cases perhaps occur more frequently than they did in the courts of common law, they are dealt with as they were in courts of common law, by the application to them, as far as possible, of accepted principles derived from the decisions of the court of chancery, or the principles of the Roman law. See CHANCELLOR; CHANCERY, COURT OF.

The jurisdiction of equity courts was divided under three principal heads—exclusive, concurrent, and assistant. The first consists almost entirely of the administration of trusts; the second comprises questions of fraud, of account, and also, it is said (Smith's *Principles of Equity,* 217), of specific performance of agreements. This matter appears, however, to fall more naturally under the assistant jurisdiction. In order to appreciate the domain of the equity courts, it must be borne in mind that common law confines its remedy usually to the awarding of damages, and to the pronouncing a judgment absolutely in favor of either plaintiff or defendant; equity, on the other hand, goes into all the merits of the case, and will deliver a modified judgment where circumstances demand it. The judges of the supreme court now all administer equity as well as law in the same manner as the court of session in Scotland had been accustomed to do from the beginning. In whichever division of the high court an action commences,

that division must dispose of all the issues raised, and pursue these to final judgment. It is true one of the divisions is still called the chancery division, and actions which used to be begun in equity courts now usually begin there still. But there is a power in such division to send an issue of fact to be decided on circuit, and after trial the division resumes its jurisdiction and works it out. The chancery division consists of judges chosen from the bar generally; and the court of appeal, which sits in two divisions, consists also of judges some versed in chancery business, and some versed in common law business. The lord chancellor since 1875 has confined his sittings to the house of lords, and occasionally to the court of appeal and to the privy council, of all of which courts he is *ex officio* a member.

Courts of Equity in the United States.—The principles according to which substantive equity is administered are the same in England and the United States. In fact, they must necessarily be the same the world over. In respect, however, to the mode of procedure, differences exist in the various American courts, though the practice formerly prevailing in the high court of chancery in England may be regarded as the basis of all the different systems. Courts of chancery, in which equity was administered as a separate system of jurisprudence, were early established in N. Y., N. Jer., Md., Del., S. Car., and Mich. The abolition of the court of chancery as a separate tribunal in N. Y., 1848, opened the way to a great reform, whereby equity and common law were to be administered in the same courts and the practice in each consolidated as far as possible. Passing from N. Y., the reformed procedure was adopted in O., Ky., Ind., Wis., Io., Minn., Miss., Kan., Neb., Nev., Cal., Or., N. Car., S. Car., Conn., Wash. Terr., Mont., Ida., Dak., Wyo., and Arizona. In most of the jurisdictions which have not adopted the plan of consolidation, namely the Federal courts, and Ark., Fla., Ga., Ill., Me., Md., Mass. Mich., N. H., Penn., R. I., Tex., Vt., Va., and W. Va., the two systems are kept distinct, but relief is administered by the same tribunal, sitting in one case as a court of equity and in another as a court of law. In some of the states the policy of strictly separating the two kinds of courts is retained, namely, Ala., Del., Miss., N. Jer., and Tennessee. The consolidation of the practice in equitable and common-law cases, which starting in New York, will gradually make its way all over the country, is one of the most important legal reforms of modern times. By it immense delay, vexation, expense, and uncertainty are spared the litigant. The most important subject usually brought before courts of equity in the United States, are applications for relief connected with trusts, fraud, mistake, injunctions, mortgages, accident, and account.

EQUITY, Principles of: in their widest sense, the principles of eternal justice, of which all human laws are but adaptations. 'Equity,' says Lord Stair (i. l. s. 17), 'is the body of the law, and the statutes of men are but as the

ornaments and vestiture thereof.' In this sense, equity coincides with the Roman precepts of law—*honesté vivere, alterum non lædere, suum cuique tribuere*—(*Inst.* i. 1. s. 3), and with the principles of justice as laid down by the inspired writer—'to do justly, to love mercy, and to walk humbly with thy God' (Micah, vi. 8). As the object of human law is to give expression to the seprinciples, equity is thus the basis of law. But it is impossible, in the nature of things, that any code of laws should provide a remedy suited to every particular case; it has, therefore, been found necessary in every civilized nation, to establish some form of authority which should control the rigor and remedy the deficiency of positive law. Thus, it is the function of the law to lay down a code of rules whereby the rights of property and the transactions of commerce shall be regulated; but by the diversities of life it happens that various circumstances will occur to cause these fixed rules to operate harshly or unjustly in particular cases. A party may complain that a contract duly entered into with all legal formalities has been obtained by fraud; the owner of an estate is incapable from infancy or lunacy of managing his affairs; a person ostensibly the owner of large property is found to be placed in possession in trust only for the benefit of others. In these and many other cases, the party who, in compliance with every rule of the law, is in possession, is not in fact the person who should in justice exercise the right. Here equity steps in. While, then, all law may be said to be equitable, inasmuch as it is the purpose of law to dispense justice, yet, in the technical sense, the term equity is confined to those cases not specially provided for by positive law. But, on the other hand, experience has shown that it would be most inconvenient, and subversive of order, if equity should arbitrarily interpose to remedy every apparent grievance, and therefore it is that the operation of equity is checked within certain limits. 'There are many cases against natural justice which are left wholly to the conscience of the party, and are without any redress, equitable or legal; and so far from a court of equity supplying universally the defects of positive legislation, it is governed by the same rules of interpretation as a court of common law, and is often compelled to stop where common law stops. It is the duty of every court of justice, whether of law or equity, to consult the intention of the legislature.'—Story, *Principles of Equity*, s. 14. Hence arises the maxim, that 'equity follows the law.' The principles of equity, therefore, as understood in modern times, may be said to be those principles of natural justice which are permitted to modify the rigor of positive law. In applying these principles to practice, the equitable jurisdiction has been intrusted by almost all nations to the same courts in which the positive law was administered: see CHANCERY, COURT OF: EQUITY, COURTS OF: COMMON LAW: ETC. In the infancy of states, the boundaries of law and equity, and the functions of the equity

judge, were not so clearly defined as in the present day. By the Roman law, a power, called the *jus honorarium* or *nobile officium*, was reposed in the pretor of controlling on equitable grounds the decisions of the ordinary tribunals. This function of the pretor commenced in the earliest time under the kings of Rome, and continued to attach to the office through all the changes which distracted the nation. Each pretor, on entering upon his office, published an edict declaring the principles by which he would be guided in discharging his duty as an equitable magistrate. The principles so declared were binding on the pretor during his year of office, but not on his successor. There can, however, be little doubt that in process of time a system of equity was gradually evolved; and ultimately, in the reign of the Emperor Hadrian, the edicts of the pretors were collected by a civilian named Julianus, and embodied in a single code called the Perpetual Edict: see EDICT. According to the practice of modern nations, the courts of law are accustomed to exercise a certain equitable jurisdiction whereby, within prescribed limits, the rules of law may be modified. In Scotland the equitable power of the court of session is called the *Nobile Officium* (q.v.).

EQ'UITY OF REDEMP'TION: interest which a mortgagor has in an estate which he has mortgaged. In Britain, equity of redemption may be devised, granted, or entailed, and the course of descent to an equity of redemption is governed by the same laws as the descent to the land would have been. Formerly the equitable interest of a mortgagor could not be recognized in a court of law, but by 7 Geo. II. c. 20, it is provided that where no suit is pending in a court of equity, either for foreclosure or redemption, but the mortgagee attempts to obtain possession by bringing an action of ejectment, in such a case, the court may restore his estate to the mortgagor, on his payment of the principal and interest due on such mortgage.—In this country, the laws on this matter vary in different states.

EQUIVALENT, a. *ĕ-kwĭv'ă-lĕnt* [F. *équivalent*—from L. *equivălen'tem*—from L. *æquus*, equal; *valens*, being worth, or of the value of]: equal in value or worth; equal in power, force or effect; of the same import or meaning: N. that which is equal in value, weight, etc., to something else; offset; compensation; in *geol.*, strata or a series of strata that have been formed contemporaneously in distant regions, or which are characterized by similar suites of fossils. EQUIV'ALENTLY, ad. *-lĭ*. EQUIV'ALENCE, n. *-lĕns*, equal value or worth; also EQUIV'ALENCY, n. *-sĭ*. EQUIVALENTS, in *chem.*, proportions by weight in which substances combine with or replace a unit of hydrogen. This term was formerly used as nearly synonomous with atomic weights (q.v.), but in recent times has been given its more definite meaning.

EQUIVOCAL, a. *ĕ-kwĭv'ō-kăl* [L. *æquus*, equal; *vōcālĭs*, sounding, speaking—from *vox*, a voice: It. *equivocale*]: of

doubtful signification; uncertain; that may be understood in different senses; doubtful. EQUIV'OCALLY, ad. *-lĭ.* EQUIV'OCALNESS, n. a double meaning; ambiguity. EQUIV'OCATE, v. *-kāt,* to use words of doubtful meaning; to quibble; to prevaricate; to evade. EQUIV'OCATING, imp.: ADJ. using ambiguous words or phrases. EQUIV'OCATED, pp. EQUIV'OCATOR, n. *-tėr,* one who. EQUIV'OCA'TION, n. *-kā'shŭn,* the use of words that have a double or doubtful meaning—usually in bad sense; prevarication. EQUIV'OCA'TORY, a. *-tėr-ĭ,* containing or savoring of an equivocation. EQUIVOQUE, n. *ā'kĭ-vōk'* or *ē'kwĭ-vōk'* [F.]: an expression in which a word has at once different meanings; a quibble.—SYN. of 'equivocal': ambiguous; indeterminate; dubious; prevaricating; evading; shuffling; quibbling.

EQUULEUS, in astronomy ('the Colt' or 'Little Horse'), one of the 48 original constellations of the Almagest, situated just between the head of Pegasus and Delphinus. It has Aquarius on its south side.

ER: Eng. affix corresponding to the French *-eur* and La, tin *-or,* and used for forming nouns of agency. It is used for persons or things of any gender, but was originally masculine, the corresponding feminine forms being *-ster, -stre,* which also has lost its feminine force. As a rule words in *-or* are of Latin origin, those in *-er* of English origin, but there is a tendency to drop the former termination in favor of the latter. *Er* is an affix also denoting an inhabitant, native of, or dweller in a place. *Er* is also the sign of the comparative degree of adjectives in English; cognate with L. *-or,* and Gr. *-eros.* The *r* represents an original *s.* *Er* is an affix also used with verbs to give them a diminutive or frequentative force; as, pat, patter; spit, sputter.

ER, *ėr:* in *her.,* frequent abbreviation of the word ermine.

ERA, or ÆRA, n. *ē'ră* [L. *œra,* the particulars of an account, period of service, an era: F. *ère:* Sp. and It. *ra,* age, era: akin to AS. *gear,* a year]: a fixed point of time from which a nation or people reckon their years, as Christian *era;* a succession of years from a fixed point, as 'we live in the Christian *era*' (see CHRONOLOGY); in *geol.,* the beginning of a new system or formation, or the entire duration of that system or formation. *Note.—An epoch* is a point of time fixed by historians, or a certain memorable period of years,—thus the capture of Constantinople is an *epoch* in the history of Mahometanism, while the flight of Mahomet is its *era.* The Crusades and the Reformation are *epochs* in the history of Christianity, but the birth of Christ begins its *era.* To indicate a starting-point of a series of events, we say, however, 'the *era* of the Reformation, of geology,' etc. *Age* denotes a certain indefinite but limited time embraced by joint human lives, and may even extend to centuries, as *iron age: generation,* a period embraced by an average human life.—SYN. of 'era': age; period; date; epoch; time.

ERADICATE, v. *ĕ răd'ĭ-kāt* [L. *erādicātus*, plucked up by the roots—from *e*, out of; *rādix*, a root: It. *eradicare*]: to pull up by the roots; to destroy thoroughly; to extirpate. ERAD'ICATING, imp. ERAD'ICATED, pp. ERAD'ICATOR, n. *-tĕr*, one who. ERAD'ICABLE, a. *-kà bl*, that can be rooted up or completely destroyed. ERAD'ICA'TION, n. *-kā'shŭn*, complete destruction; the state of being plucked up by the roots. ERAD ICATIVE, a. *-tĭv*, that cures or destroys thoroughly.—SYN. of 'eradicate': to exterminate; root out; destroy.

ERAGROSTRIS, n. *ĕr a-grŏs'trĭs* [Gr. *erōs*, love; mod. L. *agrostris*, with reference to the dancing spikelets of the flower]: in *bot.*, genus of grasses, tribe *Festuceæ*, family *Bromidæ*. Stendel enumerates 243 species. Some are cultivated as ornamental grasses

ERANTHEMEÆ, n *ĕr-ăn-thĕ-mē'ē:* in *bot.*, tribe of *Acanthaceæ*. ERAN'THEMUM, n. *-mŭm* [Gr. *eros; anthemon*, a flower]: in *bot.*, genus of *Acanthaceæ*, typical of the tribe *Eranthemeæ*. Corolla salver-shaped, stamens four, only two of them fertile. About 20 species are cultivated in greenhouses.

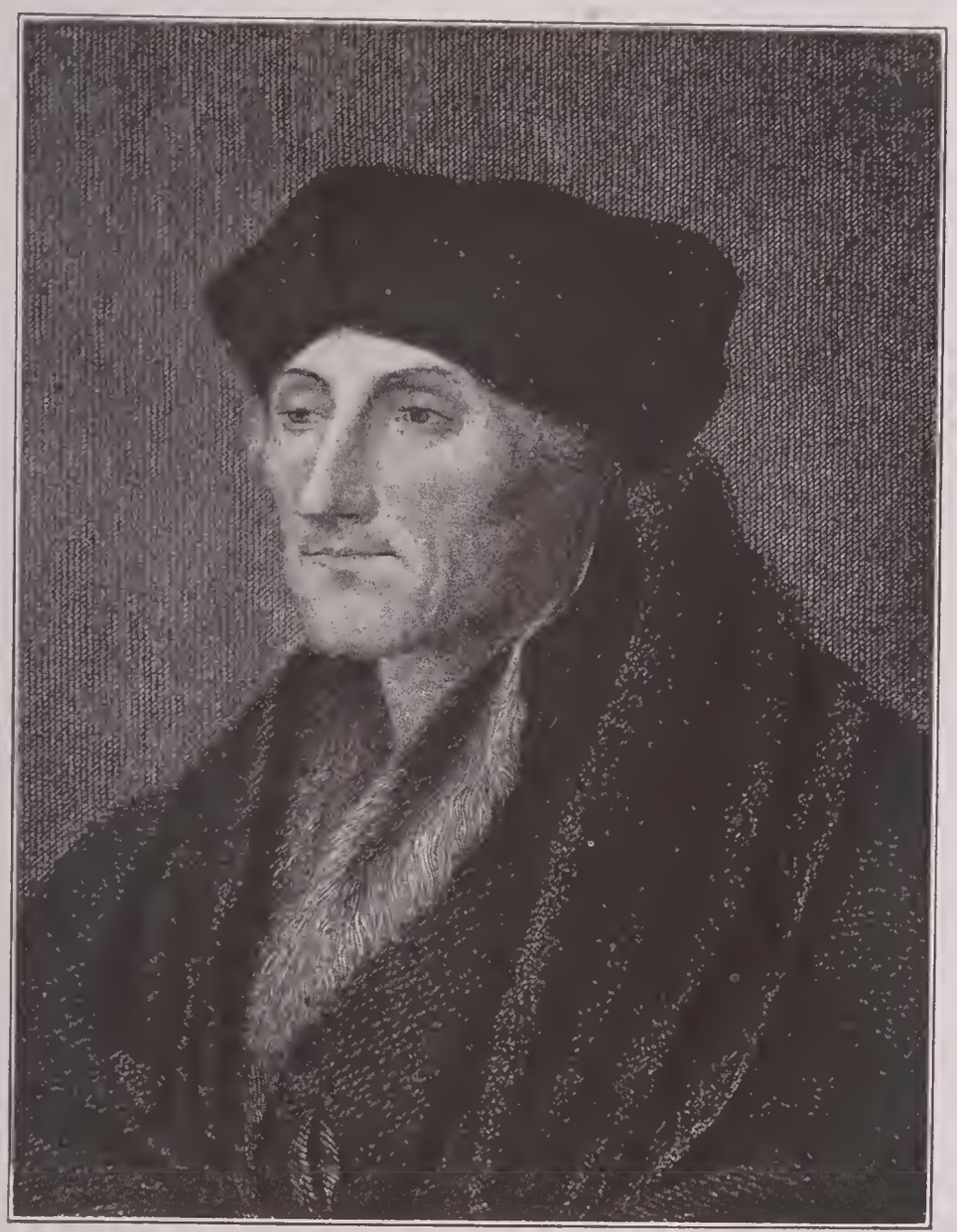
ERANTHIS, n. *ĕr-ăn'thĭs* [Gr. *eros*, love; *anthos*, blossom, flower]: in *bot.*, winter-aconite. A genus of plants, order *Ranunculaceæ*. Sepals five to eight, narrow, petaloid, deciduous; petals small, clawed, and two-lipped; stamens many; carpels five to six, stipitate; follicles many-seeded.

ÉRARD, *ā-rârʹ*, SEBASTIEN: 1752, Apr. 5—1831, Aug. 5; b. Strasburg, France: inventor and manufacturer. He was the son of a cabinet-maker, learned the manufacture of harpsichords in Paris, and under the patronage of the Duchess de Villeroi constructed the first piano-forte made in France, 1780. The popularity of the instrument induced him to establish a factory in Paris, in connection with his brother, Jean Baptiste É.; and within a short time the É. brothers became known as the best piano-forte manufacturers in Europe. During the French revolution the brothers carried on the manufacture of pianos and harps in London, but Sebastien returned to Paris 1796. He invented the grand piano with single and double action, and the famous double-action harp, made many other improvements in both instruments, and designed and built the great organ for the royal chapel of the Tuileries.

ERASE, v. *ĕ-rāsʹ* [L. *erāsŭs*, scraped out—from *e*, out of; *rāsus*, scraped: F. *raser*, to shave]: to scrape or rub out; to obliterate; to expunge; to blot out or deface. ERA'SING, imp. ERASED', pp. *-rāstʹ*. ERA'SER, n. one who, or that which. ERA'SABLE, a. *-să-bl*, that can be scraped out or obliterated. ERASE'MENT, n. *-mĕnt*, a rubbing out; obliteration. ERA'SURE, n. *-zhûr*, the act of scratching out; the place where a letter or word has been rubbed out. ERASED AND ERADICATED, in *heraldry*, applied to an object plucked off or torn out, showing a ragged edge; opposed to *coupé* or *coupy*, cut, which shows a smooth edge — SYN. of 'erase': to efface; cancel; scrape out; blot out; destroy.

ERASISTRATUS, *ĕr-a-sĭs'tra-tŭs:* one of the most famous physicians and anatomists of ancient times: lived B.C. 3d c.: supposed to have been born at Iulis, in the island of Ceos. He resided some time at the court of Seleucus Nicator, King of Syria, and while there acquired great renown by discovering and curing the disease of the king's eldest son, who was pining for the love of the young and beautiful Stratonice, whom his father in his old age had married. Afterward, E. lived at Alexandria, where, giving up practice, he applied himself with great energy and success to his anatomical studies. The date of his death (probably in Asia Minor) is not known. He founded a school of medicine, wrote several works on anatomy—in which branch he was most celebrated—on practical medicine, and pharmacy. He believed that the heart was the origin both of the veins and of the arteries, and, had it not been his conviction that the arteries contained *air* instead of *blood*, little doubt is entertained but that he would have anticipated Harvey in the discovery of the circulation of the blood. Of his numerous writings only some obscure fragments and titles have been preserved. Compare Hieronymus, *Erasistrati et Erasistrateorum Historia* (Jena 1790).

ERASMUS, *ē-răz'mŭs*, DESIDERIUS: one of the most vigorous promoters of the Reformation: 1467, Oct. 28—1536, July 12; b. Rotterdam; illegitimate son of a Dutchman named Gheraerd, or Garrit, by the daughter of a physician. In accordance with the fashion among scholars of his time, he changed the name Gheraerd into its Latin and Greek equivalents Desiderius Erasmus (more correctly, Erasmius) —meaning desired, loved. Till his ninth year, E. was a chorister in the cathedral at Utrecht. He was then sent to school at Deventer, where his talents began to display themselves in so brilliant a manner, that it was even then predicted that he would be the most learned man of his time. After the death of his parents, whom he lost at the age of 14, his guardians determined on bringing him up to a religious life, and—with the intention, it is said, of sharing his small patrimony among themselves—in his 17th year, placed him in the monastery of Emaus, near Gouda. From this constrained life, however, he was released by the Bishop of Cambray. After having taken priest's orders 1492, he went to Paris, to perfect himself in theology and the humane sciences. Here he supported himself precariously by giving private lectures, and in 1497 accompanied some Englishmen, who had been his pupils, to England, where he was well received by the king. He soon returned to Paris, and in 1506 visited Italy. At Turin he took the degree of D.D. Shortly afterward he applied to the pope for a dispensation from his monastic vows, which was granted. During the course of his journey, he visited Venice, Parma, Rome, and other cities, with his pupil, Alexander Stuart, natural son of James IV. of Scotland. At Rome, the most brilliant prospects were held out to him. Cardinal Grimani, famous lover of learning in that day, offered, out of his admiration for E., to make him 'partaker of his house and fortunes.' Other eminent men vied with Grimani in showing respect



ERASMUS.

to the young scholar, among whom were John de' Medici, afterward Leo X., Cardinal Raphael of St. George, and Giles of Viterbo, general of the Augustines. The pope (Julius II.) also offered him a place among his penitentiaries, an office of considerable consequence, and it would appear, a 'step to the highest preferments in that court.' E., who had always an eye to the main chance, regretted, at a later period of his life, that he had not accepted the offers held out to him in Rome, but meanwhile, having pledged himself to return to England, where also he had many friends, he set out for that country 1509, after the accession of Henry VIII. In several of the cities through which he passed he met friends and patrons, who wished him to settle among them, but as Henry was a correspondent of his, E. was induced to cherish the highest hopes of personal favor from that monarch, and could not be prevailed on to make long stay. He had no sooner arrived in England than he found out his mistake. At first, he lodged with Sir Thomas More, and during his stay with him composed his *Encomium Moriæ*, or Praise of Folly, the purpose of which is to expose all kinds of fools, but especially those who flourished in the church, not sparing the pope himself. For a short time he filled the office of prof. of Greek at Oxford, but on the whole was very scantily supplied with the means of subsist tence. In 1514, he returned disappointed to the continente and resided chiefly at Basel, where he died. E.'s extensivd and profound learning was equalled by his refined taste and brilliant wit. A natural love of independence and quiet made him prefer a life of learned leisure and retirement to one of greater publicity; nevertheless, the readiness with which he assumed the character of an adroit man of the world, brought upon him the hostilty of many of the nobler spirits of his time. He was no hero, and he knew it. He frankly confesses that 'he had no inclnation to die for the sake of the truth.' Luther, in whom the soul and courage of the Apostle Paul seemed to be revived, overwhelmed him with reproaches for his cowardice in regard to the Reformation. But we must not forget that E. by his mental constitution was averse to enthusiasm. He was a scholar and a critic, not a preacher or iconoclast, and he was at least honest enough to abstain from denouncing the opinions of Luther, though he disapproved strongly of his violent language. Besides, there was a tincture of rationalism in the great Dutchman, which probably helped to chill his love of *mere Lutheranism*. But his services in the cause of science were great and lasting, and his writings are still esteemed for the importance of their subjects, and their classical style. Besides editing several of the ancient authors, and various philological and theological writings, he prepared the earliest edition of the Greek Testament, which appeared at Basel 1516. This is reckoned by some his greatest work. Michaelis says that perhaps there never existed an abler editor of the New Testament, and that E. possessed in the highest degree natural abilities, profound learning, a readiness in detecting errors, with every qualification that is requisite to critical sagacity. His best-known work, however, is his

Colloquia, a master-piece. Of all his writings this has had the greatest influence. The first edition appeared 1522, but did not please E., who issued a second the same year. A third appeared 1524. This book, which was meant, according to Erasmus, only to make youths better Latinists and better men, was condemned by the Sorbonne, prohibited in France, and burned in Spain. No one who takes up the book will wonder at its condemnation. It contains the most virulent and satirical onslaughts on monks, cloister-life, festivals, pilgrimages, etc., but is disfigured by lewd and unchaste passages wholly inexcusable. The work has been translated into almost all modern languages. His *Encomium Moriæ*, or Praise of Folly, already mentioned, was published in the original, with a German translation, and illustrations by Holbein, by W. G. Becker (Basel 1780). E. himself superintended an edition of his works published by Frobenius in Basel. The most complete edition is that of Leclerc (10 vols. Leyden 1603–06). The life of E. has been written in French by Burigny (2 vols. Paris 1758), in German by Müller (Hamburg 1828), and in English by Knight (Cambridge 1726) and Drummond (2 vols. 1873).

ERASTIAN, a. *ĕ-răs'tĭ-ăn:* pertaining to *Erastus* or his doctrines. ERAS'TIANS, n. plu., those professing the doctrines of *Erastus*, a German divine and physician of the 16th century, who taught that the church ought to be wholly dependent on the state for its government and discipline. ERAS'TIANISM, n. *-ĭzm*, the principles of the Erastians.

ERASTUS, *ē-răs'tŭs*, THOMAS: 1524, Sep. 7—1583, Dec. 31; b. Baden, Switzerland: physician and theologian. His real name was *Lieber*, which, according to the fashion of his times, he translated into Greek. In 1540, he went to the Univ. of Basel, where he studied divinity, philosophy, and literature. He subsequently visited Italy, where he betook himself to medicine, and obtained the degree M.D. from the Univ. of Bologna. After nine years, he returned to his own country, and lived at the court of the princes of Henneberg, where he acquired great reputation as a medical practitioner. The elector palatine, Frederick III., invited him to his court, and appointed him first physician and counselor of state. He also conferred on him the chair of physic in the Univ. of Heidelberg. In 1581, he was selected to fill a similar office at Basel, where he died, after establishing a liberal foundation for the provision and education of poor students in medicine, long called the *Erastian foundation*. Among E.'s medical works are *Disputationes de Medicina Nova Philippi Paracelsi* (Basel 1572–3), *Theses de Contagio* (Heidelberg 1574), and *De Occult. Pharmaco. Potestatibus* (Heidelberg 1574). As a physician, E. is creditably characterized by his distrust of abstract and *a priori* theorizing, and his conviction that experimental investigation is the only road to knowledge. But his fame now rests chiefly on what he wrote in ecclesiastical controversy. In his book *De Cœna Domini*, he contended for the figurative interpretation of the passage, 'This is my body,' etc., and supported this view at the conference held at Maul-

bron between the divines of the Palatinate and those of Wittenberg. But his great work is his *Explicatio Quæstionis Gravissimæ de Excommunicatione.* Although this work was not published till some years after his death, E. had published the same opinions in the form of theses, directed against Gaspar Olevianus, a refugee from Treves, and various other persons, who were anxious to confer on ecclesiastical tribunals the power of punishing vices and misdemeanors. E. denied the right of the church to excommunicate, exclude, absolve, censure—in short, to exercise discipline. Denying 'the power of the keys,' he compared a pastor to a prof. of any science, who can merely instruct his students; he held that the ordinances of the gospel should be open and free to all, and that penalties being both in their nature and effect *civil* and not *spiritual,* ought to be inflicted only by the civil magistrate. E. formed no *sect,* neither did he wish to do so. His desire was exactly contrary—viz., to preserve an external harmony at the expense even of the purity of the visible church. He would have let the wheat and tares not only grow together, but also remain entirely undistinguished in the church until the end of the world. Many eminent men, especially in the Church of England, have had similar opinions both before and after E., such as Cranmer, Redmayn, Cox, Whitgift, Lightfoot, Selden, etc. His views had some eloquent adherents in the Westminster Assembly 1643–49; but after a long discussion were rejected with but one dissentient vote. The term Erastian has long been a favorite epithet of reproach among the more rigid Presbyterians in Scotland, but has not been employed with any precision. All persons who deny the power of an established church to alter her own laws without the consent of the state —as, for example, the law of patronage—are generally accused of *Erastianism,* though the principles of E. have literally nothing to do with such a question. An English translation of the *Explicatio* was published 1669, re-edited by Dr. Robert Lee 1845.

ERA'SURE, or RA'ZURE: scraping or shaving out of words in a deed or other formal writing. Except in the case of a will, the presumption, in the absence of rebutting evidence, is that the erasure was made at or before execution. Doe ex dem Tatham *v.* Gattamore, 17 L. T. Rep. 74. If an alteration or erasure has been made in any instrument subsequent to its execution, that fact ought to be mentioned (in the Abstract, or epitome of the evidences of ownership), together with the circumstances under which it is done, and more particularly so as a fraudulent alteration by either of those means, if made by the person himself taking under it, would vitiate his interest altogether. It was formerly considered in England that an alteration, erasure, or interlineation (q.v.), would void the whole instrument, even in those cases where it was made by a stranger; but the law in both England and the United States is now otherwise, as it is clearly settled that no alteration made by a stranger will prevent the contents of an instrument from retaining its original effect and operation, where it can be plainly shown what that effect and operation actually was. To accomplish

this, the mutilated instrument may be given in evidence as far as its contents appear; and intrinsic evidence will be admitted to show what portions have been altered or erased, also the words contained in such altered or erased parts; but if, for want of such evidence, or any deficiency or uncertainty arising out of it, the original contents of the instrument cannot be ascertained, then the old rule would become applicable, or, more correctly speaking, the mutilated instrument would become void for uncertainty.—Hughes' *Practice of Conveyancing*, I. 124, 125. If a will contains any alterations or erasure, the attention of the witnesses ought to be directed to the particular parts in which each alteration occurs, and they ought to place their initials in the margin opposite, before the will is executed, and to notice this having been done by a memorandum, added to the attestation clause at the end of the will (*Ib.* p. 945). In Scotland, the rule as to erasure is somewhat stricter; see Menzies's *Lectures on Conveyancing*, p. 124. The Roman rule was, that the alterations should be made by the party himself, and a formal clause was introduced into their deeds to this effect, 'Lituras, inductiones, superinductiones, ipse feci.' As a general rule, alterations with the pen are in all cases to be preferred to erasure, and suspicion will be most effectually removed by not obliterating the words altered so completely as to conceal the nature of the correction. 'The worst kind of deletion,' says Lord Stair, 'is when the words deleted cannot be read (but if they are scored that they can be read, it will appear whether they be *de substantialibus*), for if they cannot be read, they will be esteemed to be such unless the contrary appear by what precedes and follows, or that there be a marginal note, bearing the delction, from such a word to such a word, to be of consent.'

ERATO, n. *ĕr'ă-tō* [Gr. *Eratō*, one of the Muses—from *erāō*, I love]: the Muse who presided over lyric, and especially amatory, poetry. ERATIVE, a. *ĕr'ă-tĭv*, pertaining to the Muse who presided over amatory poetry.

ERATOSTHENES, *ĕr-a-tŏs'thĕ-nēz:* eminent Greek writer, called, on account of his varied erudition, the *Philologist:* B.C. 276—B.C. 186; b. Cyrene. Among his teachers were Lysanias the grammarian, and Callimachus the poet. By Ptolemy Euergetes, he was called to Alexandria to superintend his great library. Here he died of voluntary starvation, at the age of 80, having become blind, and wearied of life. E. holds eminent rank among ancient astronomers. He measured the obliquity of the ecliptic, and the result at which he arrived—viz., that it was 23° 51′ 20″—must be reckoned a very fair observation, considering the age in which he lived. Hipparchus used it, and so did the celebrated astronomer Ptolemy. An astronomical work which goes under the name of E., but which is certainly not his, is extant, called *Katasterismoi;* it contains an account of the constellations, their fabulous history, and the stars in them. It is believed, however, that E. did draw up a catalogue of the fixed stars, amounting to 675· but it is lost. A letter to Ptolemy, king of

Egypt on the duplication of the cube, is the only complete writing of his that we possess. E.'s greatest claim to distinction, however, is as a geometer. In his attempt to measure the magnitude of the earth, he introduced the method used at the present day, and found the circumference of the earth to be 252,000 stadia; which, according to Pliny, is 31,500 Roman miles. But as it is not known *what* stadium E. used, it is possible that he came nearer the actual circumference than the above figures indicate. His work on geography must have been of great value in his times; it was the first truly scientific treatise on the subject. E. wrought into an organic whole the scattered information regarding places and countries related in the books of travels, etc., in the Alexandrian library. He wrote also on moral philosophy, history, grammar, etc. His work on the *Old Attic Comedy* appears, from the remains which we possess, to have been a learned and very judicious performance. Such fragments of E.'s writings as are extant have been collected by Bernhardy in his *Eratosthenica* (Berlin 1822).

ERBIUM, n. *ėr'bĭ-ŭm:* a rare metallic element, occurring in the form of a tantalate or silicate in the minerals gadolinite, fergusonite and euxenite, and as a phosphate in the mineral xenotime. It has the chemical symbol Er, or E, and an atomic weight of about 166. The oxide of erbium, Er_2O_3, has a pale rose color, is infusible, and, when strongly heated, glows with a brilliant green light. The name erbium is derived from Ytterby, Sweden, where the mineral gadolinite is found. The recognition of erbium as a new element is attributed to Mosander (1843); but the metal itself has not yet been isolated.

ERCILLA Y ZUÑIGA, *ĕr-thēl'yâ ē thôn-yē'gâ*, Alonso: Spanish poet: b. Madrid, 1533, Aug. 7; date of death unknown. He was the third son of a Spanish jurist, and at an early period became page to the Infanta Don Philip, son of Charles V., accompanying him on his journey through the Netherlands, and some parts of Germany and Italy, and in 1554, to England, on the occasion of the celebration of Philip's nuptials with Queen Mary. Shortly afterward E. went with the army dispatched to America to quell the insurrection of the Auracanians on the coast of Chili. The difficulties with which the Spaniards had to contend, the heroism displayed by the natives in the unequal contest, and the multitude of gallant achievements by which this war was distinguished, suggested to E. the idea of making it the subject of an epic poem. He began his poem on the spot, about 1558, occasionally committing his verses, in the absence of paper, to pieces of leather. An unfounded suspicion of his having plotted an insurrection involved him in a painful trial, and he had actually ascended the scaffold before his innocence was proved. Deeply wounded, the brave soldier and poet turned to Spain, but Philip treating him with great coldness and neglect E. made a tour through France, Italy, Germany, Bohemia, and Hungary. For some time he held

the office of chamberlain to the emperor Rudolph II., but 1580 returned to Madrid, where the latter years of his life were spent in obscurity and poverty. He died at Madrid. His historic epos, written in the octo-syllabic measure, and entitled *Araucana*, is, with the exception of a few episodes, a faithful description of actual events. Cervantes, in his *Don Quixote*, compares it with the best Italian epics, and it has undoubtedly not a little of the epic style and spirit. Of its three parts, the first is the freshest in character, having been completed before the author's return to Europe, where it was published separately (Madrid 1569). In Spain, and other countries, many reprints of the poem appeared, notably in 1776, 1828, 1851. A German translation was published by Winterling (1831), and a complete French one by Nicolas (1870). See Royer's *Étude sur l'Araucana de Ercilla* (1880).

ERCINITE, n. *ėr'sĭn-īt* [from *Sylva Hercynia*, Roman name for the Harz Mountains, in which in was found at Andreasberg]: in *min.*, the same as HARMOTOME (q.v.).

ERCKMANN—CHATRIAN, *ĕrk'mân, shâ-trė-ŏng'* (EMILE ERCHMANN and ALEXANDRE CHATRIAN): two French men of letters. Erckmann was born Phalsbourg, 1822, May 20. Chatrian was b. in the village of Soldatenthal 1826, and died 1890, Sep. 4. Both were born in what was then the French dept. of Meurthe, now reunited to Germany as part of the imperial territory of Alsace-Lorraine. Erckmann, the son of a bookseller, went through a rather irregular course of study at the college of his native town, went to Paris 1842 to study law, which he broke off several times, and only passed his third examination 1857, and finally abandoned the study in the following year. During the interval, he had set himself to make a name in literature, in co-operation with M. Chatrian. The latter, belonging to an old family of glass-makers in Meurthe, ruined by reverses in trade, was acting as tutor at the college of Phalsbourg, when 1847, he was introduced to M. Erckmann. From that time the two friends employed their pens in the same works till a temporary break in collaboration 1889; and it was only about 1863 that the authors informed their readers that the numerous works of fiction, which had obtained a widespread popularity, and were supposed by the general public to be the work of a single writer, were the fruits of their friendly collaboration. Their early works attracted comparatively little notice; and it is said that their first work was rejected by all the newspapers of Paris, and by many provincial journals. In 1848 they published several feuilletons in the *Démocrate du Rhin*, which had just been started: *Le Sacrifice d'Abraham*, *Le Bourgmestre en Bouteille*, etc., which they have since published separately. At the same time they wrote a drama, *Le Chasseur des Ruines*, for the Ambigu-Comique, which the theatre accepted, subject to changes, which they refused to make. They produced another drama, *L'Alsace en* 1814, for the theatre of Strasbourg, which was suppressed by the prefect

on the second representation. They wrote numerous novels at this time for different journals, some of which were very little noticed, while others remained in MS. for years. Despairing of being able to live by their pens Erckmann recommenced his law studies, and Chatrian obtained a situation in the office of the Eastern railway. It was not till 1859 that *L'Illustre Docteur Mathéus* (1859; 3d ed. 1864), published by the Librairie-Nouvelle, gave a certain *éclat* to the collective name of Erckmann-Chatrian. *Le Fou Yégof* (1862) is one of a series of novels, the subjects of which are taken from their national history, and gives a picture of the invasion of 1814. *Le Conscrit de* 1813 (1864) and *Waterloo* (1865) are fragments of an autobiography, and are supposed to be the recollections of a common soldier, and relate the disastrous campaigns of 1813-14. These may be called the gems of their collection. *Le Joueur de Clarinette* (1863), a simple story of a village musician, and *Les Amoureux de Catharine*, another tale of village life in the same volume, are nearly perfect. *L'Homme du Peuple* appeared 1865, and is less favorably spoken of as a work of art. It pictures the life of the modern French workman. In 1866 appeared *La Maison Forestière* and *La Guerre;* in 1867, *Le Blocus*, which has been translated under the title *The Blockade of Phalsbourg;* a historical romance 1868, *Histoire d'un Paysan;* 1869, *Le Juif Polonais*, a play. In 1889, a serious quarrel occurred between the two authors concerning a division of profits, and for a time they were entirely estranged; but before the death of Chatrian they were reconciled. Afterward Erckmann wrote several stories, among them being *Kaleb et Khora* and *La Première Campagne du Grand-père Jacques.*

ERDMANN, *ėrd'mān*, J. E., German philosopher: b. Wolmar, Livonia, in 1805; studied at Dorpat and Berlin; became professor of philosophy at Halle, where he remained until his death in 1892. He was a leader of the more conservative group of Hegelians, known as the 'Right,' who maintained that Hegel's teachings, rightly understood, accord with popular faith, and the teachings of the church. He was a brilliant scholar and lecturer, and wrote numerous treatises, of which his *History of Philosophy*, in 3 vols., has been translated into English by W. S. Hough (Lond. 1892).

ERDMANN, Otto Linné, German chemist: b. Dresden 1804, April 11; d. Leipsic 1869, Oct. 9. His researches embrace a wide range of subjects. He examined minutely the technology of nickel, and described some of its compounds; analyzed a number of minerals and slags, and experimented on several other points of inorganic chemistry. In organic chemistry his chief research is upon indigo, in the course of which he discovered isatin. The most important work in which he engaged was that upon the combining weights of several of the elements. In company with Marchand he made determinations of oxygen, carbon, hydrogen, sulphur, calcium, copper, mercury, and some others, and his numbers have been

fully confirmed by subsequent experimenters. He was the author of a chemical text book and for many years conducted the *Journal für technische und ökonomische Chemie*, which was afterward changed to the *Journal für praktische Chemie*.

ERDMANNITE, n. *ėrd'man-īt* [named after Prof. *Erdmann*]: in *mineral.*, name of two minerals; *Erdmannite of Berlin*, a variety of orthite; *Erdmannite of Esmark;* a variety of zircon.

ERDMANNSDÖRFER, *ĕrd'mânz-dėrf-ĕr*, Bernhard, German historian: b. Altenburg, 1833, Jan. 24; d. 1901. He held professorships of history at several German universities, and among his more important works are: *Das Zeitalter der Novelle in Hellas* (1870); *Deutsche Geschichte vom Westfalischen Frieden bis zur Regierungszeit Friedrichs des Grossen* (1890–4).

ERDMANNSDÖRFER, Max, German musician: b. Nuremberg 1848. He conducted the court orchestra at Sondershausen 1871–80, becoming director of the Imperial Musical Society at Moscow 1882 and professor in the conservatory in that city. He was leader of the Philharmonic Society at Bremen 1889–95, and became leader of the court orchestra at Munich 1896. His chief works are: *Prinzessin Ilse* (1870); *Schneewittchen* (1873); and *Traumkönig and sein Lieb.*

ERE. conj. and prep. *ār* [Goth. *air*, early; AS. *ær*, early, before; Dut. *eer*, sooner: Ger. *eher*, before; *erste*, first]: before; sooner than. Erst. ad. *ėrst*, at first; in early times; once; long ago. Ere long, ad. *ār'lŏng*, a contraction for 'before long time,' or 'before a long time shall elapse.' Ere now, ad. before this time. Erewhile, a. ad. *ār-hwīl*, some time ago; a little while before.

EREBUS, n. *ĕr'ė-bŭs* [L. in *anc. myth.*, the god of darkness, son of Chaos, and brother of Nox]: darkness; the region of the dead; hell; it denotes especially the gloomy cavern beneath the earth through which the shades of the dead are supposed to pass to Hades. Erebus married his sister, Night, and was the father of the Light and Day. He was transformed into a river, and plunged into Tartarus, because he aided the Titans.

EREBUS, *ĕr'ė-bŭs*, Mount, and Mount Terror: volcanoes discovered by Sir James Ross while exploring Victoria Land, then supposed to be an antarctic continent, 1841, Jan., and named after the ships of his expedition; lat. 77½° s. and long. 168° 12′ e. Mt. Erebus is 12,400 ft. high and was emitting flame and smoke when discovered, and Mt. Terror is 10,900 ft. high, and inactive.

ERECHTHEUS, *ē-rĕk'thūs*, or Erichthonius, *ĕr-ĭk-thō'nĭ-ŭs:* mythical Attic hero, said to have been the son of Hephaestus and the Earth, and to have been reared by Athena. One form of the tradition states that when a child he was placed by Athena in a chest, which was intrusted to Agraulos, Pandrosos, and Herse, daughters of Cecrops, with the strict charge that it was not to be

opened. Agraulos and Herse, however, unable to restrain their curiosity, opened the chest, and discovering a child entwined with serpents, they were seized with madness, and threw themselves down the most precipitous part of the Acropolis. Afterward Erechtheus was the chief means of establishing the worship of Athena in Attica. He is regarded as the founder of the Erechtheum, the temple of Athena Polias, guardian of the city.

This original ERECHTHEUM, which contained Erechtheus's tomb, and was called by his name, was burned by the Persians, but a new and magnificent temple was raised on the same site—north of the Parthenon, and near the n. wall of the Acropolis—in the beginning of B.C. 4th. c. The second Erechtheum was a splendid structure of the Ionic order, oblong, extending from e. to w., abutting in side chambers at the w. end, toward the n. and s., and having porticoes adorned with columns at its e., n., and s. extremities. It is now an utter ruin.

ERECT, v. *ĕ-rĕkt'* [L. *erectus*, raised or set up—from *e*, out of; *rectus*, straight or upright]: to raise; to set up; to build; to found or establish: ADJ. in a perpendicular position; upright; firm, unshaken, or bold. EREC'TING, imp. EREC'TED, pp. ERECT'LY, ad. *-lĭ*, in an upright position. ERECT'NESS, n. the being perpendicular in position or form. EREC'TABLE, a. *-tă-bl*, that can be erected. EREC'TILE, a. *-tĭl*, that which may be erected; having the property of raising itself. EREC'TIVE, a. *-tĭv*, able or tending to erect. EREC'TER, n. *-tĕr*, one who. EREC'TOR, n. *-tor*, a muscle that erects; he or that which erects. EREC'TION, n. *-shŭn* [F.—L.]: the act of raising or building; settlement or formation; a building of any kind.—SYN. of 'erect, v.': to establish; found; elevate; construct; institute; lift up; set up; exalt; form; make.

EREC'TION, LORDS OF: those of the nobility in Scotland to whom the king, after the Reformation, granted lands, or tithes, which formerly belonged to the church. They were called also Titulars of Tithes; the gifts being not confined to the nobility. The grants were made under the burden of providing competent stipends to the reformed clergy—an obligation very little attended to by the grantees, prior to the decrees arbitral of Charles I., 1629. Ersk. B. ii. tit. 10, s. 18.

EREGLI, *ĕr'ĕg-lē*, or EREKLI, *ĕr'ĕk-lē* (anc. *Heraclea*): town of Asia Minor on the Black Sea, 128 m. e.n.e. of Constantinople, lat. 41° 15′ 30″ n., long. 31° 28′ e., where Xenophon's army embarked on their return to Greece. It has a commodious harbor, large ship-building yards, and valuable coal interests, exports coal, timber, silk, and wax, and imports colonial produce, tobacco, and iron. Pop. 5,000.—EREGLI (anc. *Archalla*) is the name also of a town of Asiatic Turkey, 90 m. e.s.e. of Konieh, in the vilayet of the same name.—EREGLI (anc. *Perinthus*) is the name also of a town of Roumelia, European Turkey, on the Sea of Marmora, 55 m. w. of Constantinople; see of a Greek bishop.

EREMACAUSIS, n. *ĕr'ĕ-mă-kaw'sĭs* [Gr. *erēmă*, silent, gentle; *kausis*, a burning]: the slow chemical change or combustion without sensible heat, caused by the action of the oxygen of the atmosphere on moist animal or vegetable bodies, as in the slow decay of wood. The process consists in the oxygen (O) of the air combining with the hydrogen (H) of the wood forming water (HO), and in less quantity with the carbon (C) forming carbonic acid (CO_2), leaving a brown mold or powder, called by chemists ulmin, or humus, in which carbon preponderates.

EREMITE, n. *ĕr'ĕ-mīt:* another spelling of HERMIT, which see.

EREMITE, n. *ĕr'ĕ-mīt* [Gr. *erēmos*, lonely, in allusion to its rarity]: in *mineral.*, the same as MONAZITE (q.v.).

EREMUS, n. *ĕr'ĕ-mŭs* [Gr. *erēmos*, solitary]: in *bot.*, a ripe carpel partially detached from the rest.

ERETHISM, n. *ĕr'ĕ-thĭzm* [Gr. *erĕthismos*, irritation]: in *med.*, a state of irritation or excitement of a part, different from, or short of, the inflammatory condition, although often passing into it; unnatural energy of action. ERETHISTIC, a. *-thĭs'tĭk*, pertaining or relating to erethism.

ERETHIZON, n. *ĕr-ĕ-thīz'on* [Gr. *erethizōn*, pp. of *erethizō*, I rouse, I fight]: in *zool.*, genus of *Cercolabidæ*, a family akin to the *Hystricidæ*. *Erethizon dorsata* is the Canadian porcupine.

ERETRIA, *ĕ-rē'trĭ-a:* ancient city of Greece, on the w coast of the island of Eubœa, a few miles s.e. of Chalcis, with which it maintained a commercial rivalry many years. It was a rich and powerful city previous to the Trojan war, and was destroyed by the Persians for having assisted the Ionic cities in their revolt, B.C. 490. It was rebuilt s.e. of its old site, named New E., took an important part in the Peloponnesian war, and contained a famous school of philosophy.

ERF, n. *ėrf*, ERVEN, n. plu. *ėr'vėn* [Dut.]: garden plot, usually containing about half an acre.

ERFURT, *ĕr'fûrt:* city of Prussian Saxony, anciently cap. of Thuringia; in a highly cultivated plain, on the right bank of the Gera, 14 m. w. of Weimar. Till 1873 E was strongly fortified, and was accounted a fortress of the second rank. Its two citadels, the Petersberg and the Cyriaksburg, were formerly monasteries. Among the numerous churches, the cathedral and the Church of St Severus are the finest. The cathedral is one of the most venerable Gothic buildings in Germany, and possesses, besides a very rich portal, sculptures dating from the 11th to the 16th c. Of the convents, only that of the Ursuline nuns remains. The monastery of St. Augustine, famous as the residence of Luther, whose cell was destroyed by fire 1872, was converted 1820 into an asylum for deserted children. The other remarkable buildings are, the university, founded 1378, suppressed 1816; the royal acad ; the library, containing 60,000 vols.; numerous educational establishments, infirmaries, etc. Horticulture and extensive trade in seeds

are carried on. The principal manufactures are woolen, silk, cotton, and linen goods, yarn, shoes, stockings tobacco, leather, etc.

Erfurt is said to have been founded in the beginning of the 5th c. by one Erpes, from whom it took its original name of Erpesford. During the middle ages, at the time of its highest prosperity, Erfurt was strongly fortified, and contained 60,000 inhabitants. In 740, St. Boniface founded a bishopric at Erfurt; and in 805 it was converted into an entrepôt of commerce by Charlemagne. It afterward belonged to the Hanse-league, then to the elector of Mainz, from 1801–06 to Prussia, and from that time till 1813 it was under French rule. Erfurt was finally restored to Prussia by the Congress of Vienna. In the spring of 1850, the parliament of the states, which had combined together for union, held its sittings at Erfurt. Pop. (1900) 85,202.

ERG: see ELECTRICAL UNITS.

ERGASILIDÆ, n. *ēr-ga-sĭl′ĭ-dē:* family of crustaceans, placed under Milne Edward's order *Siphonostomata,* now *Epizoa* or *Parasita.* Most of the species are parasitic on the gills of fishes, one on those of the lobster. ERGASIL′-IUS, n. *-ŭs* [Gr. *ergasia,* work; daily labor]: genus of crustaceans, typical one of the family *Ergasilidæ.*

ERGO, conj. *ėr′gō* [L.]: therefore; consequently; often used in a jocular way.

ERGON, n. *ėr′gon:* occurs in composition, as *ergon-*eight.

ERGOT, n. *ėr′gŏt* [F. *ergot,* cock's spur]: a fungus attacking the germen of grasses, especially rye. This fungus is propagated by means of minute spores which are blown about by the wind or carried about by insects. When lodged on grasses they germinate and form a more or less viscid yellowish mass filled with spores of another type, the conidia. These in turn may be carried by insects to other grasses. As the fungus grows and, little by little, replaces the tissue in the grain, there results a brownish to blackish mass which in different species assumes different shapes. These are collected with the different grasses and may be the cause of various types of poisoning in cattle. The fungus growing on rye constitutes the ergot of commerce; it consists of purplish grain-like masses, one half to three-quarters of an inch long and one eighth to one-quarter of an inch wide, and somewhat resembling large grains of rye. Microscopically the ergot is made up of the closely matted mycelium of the fungus, which has entirely replaced the cells of the seed.

Chemically considered, ergot is an extremely complex body, and it cannot be said that even at the present time a full knowledge of its composition has been gained. It contains large quantiteis of an inert fixed oil, a resin, and one or two active principles which, from the earliest chemical investigation to the present, have been called by

no less than 50 or 60 different names, among these being ergotine, ecboline, ergotin, cornutine, sphacelic acid, ergotic acid, etc.

Medicinally, ergot is important; it has the singular power of stimulating an involuntary muscle causing it to contract; its action is, therefore, forcibly manifested on the uterus, which contains more unstriped muscular tissue than any other organ of the body. It here causes contractions, the uterus becoming hard and pale, and forces the blood out of the uterine blood vessels. During pregnancy the action is much more pronounced, since the uterus is so much more dilated.

In addition to its use in uterine disorders, ergot is also employed to control blood pressure, as it contracts the cardiac muscle and the arterial walls, causing an increase in the force of the heart's contraction and a marked rise in the blood-pressure.

ERGOTISM: a disease caused by eating ergot-infected grain or grasses. In cattle ergotism is characterized by changes, particularly in the blood vessels, causing swellings below the knees or ankles, with gangrene of the skin, and at times symptoms of paralysis of the extremities. In years when weather conditions have permitted wide and abundant growth of the ergot fungi, large areas of pasture land have become infected, resulting in a widespread poisoning of cattle, almost resembling an epidemic. In man, the disease is most frequent where rye bread is commonly eaten; it being due to the use of infected grain in the preparation of the bread. The chief symptoms are those due to changes in the blood vessels of different parts of the body, with secondary consequences. Thus in some cases there is loss of touch-sensation, in others disease of the spinal cord, both due to the cutting off of the blood supply.

ERHARDT, *ĕr'hârt*, Joel B.: b. Pottstown, Penn., 1838: lawyer. He studied law and entered the Univ. of Vt. In 1861, Apr., he left the univ., enlisted in the 7th N. Y. regt., and served with it during its term, and on returning to New York was admitted to the bar. Shortly afterward he enlisted in the 1st Vt. cav., became capt., and resigned 1863. He was provost marshal of the 4th cong. dist., N. Y., 1863, Apr. 15–1865, May 1, and was then appointed asst. U. S. dist. atty. In 1876 he was appointed a police commissioner of New York. Mayor Ely preferred charges against Erhardt and two other commissioners, on which they were tried but not removed. In 1879 other charges were preferred against him by a fellow-commissioner, and on the accession of Mayor Cooper he preferred charges against all the commissioners for mismanagement and incompetency. A long trial followed, but while the certificates of removal were awaiting Gov. Robinson's signature, a successor to Erhardt was confirmed. In 1888, Nov., he was defeated as Republican candidate for mayor of New York, and from 1889–93 was collector of the port of New York.

ERIC, *ĕr'ĭk:* Scandinavian form of the name Henricus, Enrico, and Henry of southern nations. Many kings of the name reigned separately in Denmark and Sweden, and some ruled over the whole of Scandinavia after the union of Calmar. The two earliest rulers of the name in Denmark merit notice from their association with the introduction of Christianity.

ERIC I. (died 860) protected the Christians in the latter part of his reign, and, under the direction of the missionary Ansgar (q.v.) or Anscharius, founded the cathedral of Ribe, the first Christian church in the land. In his time the Northmen began those incursions into southern countries which were destined to exercise so permanent an influence on European history.

ERIC II. followed in the steps of his father, and permitted Ansgar to prosecute the labor of converting and civilizing the people, which won for him the title of the Tutelar Saint of the North. To Eric II. is ascribed the reorganization of those guilds which finally merged in the municipal corporations of the middle ages, but which were, at first, a mere modification of the heathen brotherhoods of the Scandinavian heroic ages, and constituted associations, whose members were a privileged class, separated by distinct laws, rights, and duties from the rest of the people.

In the 12th c. Denmark suffered in an equal degree from the two Erics who ruled over her, for while ERIC, surnamed Emun, exhausted the strength of the land by the indomitable pertinacity with which he endeavored, by force of arms, to compel the Vandals and other piratical neighbors to accept the Christianity which he thrust upon them, ERIC 'the Lamb' crippled the powers and resources of the crown by his pusillanimous subserviency to the clergy.

The three Erics (ERIC VI., VII., and VIII.) who occupied the throne 1241–1310, with only the intermission of a few years, are associated with one of the most disastrous periods of Danish history. Long minorities, the suicidal practice of dismembering the crown-lands in favor of younger branches of the royal house, and futile attempts to restrain the ever-increasing encroachments of the church, combined to bring the country to the brink of destruction. Eric VI. (Plogpenning) and Eric VII. (Glipping) were both assassinated, the former at the instigation of a brother, and the latter in revenge for a private injury. Eric VIII., last of the name before the union of Calmar, died childless, and was succeeded, 1319, by his ambitious brother Christopher, who saw himself compelled to repay his partisans at the expense of almost all the prerogatives and appanages which still belonged to the crown.

In *Sweden,* the first of the name who merits notice is King ERIC, surnamed the Saint, slain in battle 1161, after a short reign, which was signalized, in that age of anarchy, by the foundation of many churches and monasteries, and by the promulgation of an excellent code of laws, known as *St. Eric's Lag.* This law contained provisions by which a higher status in society was secured to women, by granting them a fixed proportion of the heritage of their male rela

tives, and certain definite privileges within their households St. Eric waged frequent war with the Finns, and compelled them to adopt the outward forms of Christianity. The two namesakes and descendants of St. Eric, who ruled in Sweden during the 13th c., and ERIC XII. (reigned 1350–59), have little claim to notice, for internal disturbances and wars with their neighbors brought about the same fatal results as those associated with the reigns of the Erics in Denmark during the middle ages.

In 1412, on the death of the great Margaret, her relative, ERIC of Pomerania, succeeded to the triple crown of Scandinavia, in accordance with the articles of the famous treaty of Calmar. The noble heritage that had been bequeathed to Eric required a firmer hand and a braver spirit than his to keep it in check; and his reckless disregard of treaties and oaths, his neglect of his duties, and his misdirected ambition, led, after years of dissensions, maladministration, and disaffection, to the inevitable result that Eric was declared to have forfeited the respective thrones of the several kingdoms, which proceeded to elect rulers of their own. The intestine wars which then arose plunged the whole of Scandinavia into anarchy, and sowed seeds of dissension among the three kindred nations, which bore fatal fruits in subsequent ages. The last ten years of Eric's life were spent in piracy in the island of Gothland, whither he had retired with his mistress and a band of followers, and whence he sent forth piratical expeditions to pillage both friends and foes. Eric married Philippa, daughter of Henry IV. of England, whose memory is still cherished in the north, on account of the many noble deeds with which local tradition associates her name.

ERIC XIV., the last of the name who reigned in Sweden, had the distinction of being at once one of the worst and one of the most unhappy of the name. He succeeded, 1560, to the throne of his father, Gustaf Vasa, perhaps the greatest and worthiest monarch that ever reigned over Sweden, and immediately on his accession he made known the difference that was so unfavorably to distinguish his reign from that of his father, by quarrelling with his brothers, thwarting the nobles, and opposing the lower orders. His fickleness and extravagance were evinced in a succession of embassies, which were in turn sent to almost every European court, to demand a consort for this vacillating monarch, who usually changed his mind before his envoys had time to fulfil their missions. Elizabeth of England and Mary of Scotland were more than once the objects of his matrimonial schemes; but when the resources of the country had been seriously crippled by these costly and absurd expeditions, Eric married a Swedish peasant-girl, who ultimately acquired an influence over him ascribed by the superstitious to witchcraft, since she alone was able to control him in his violent paroxysms of blind fury. It is probable that Eric labored under remittent attacks of insanity, and that to this may be attributed the bloodthirsty cruelty with which he persecuted those of his own relatives or attendants who fell under his suspicion. His capricious cruelties at length alienated the minds of his

subjects, who, wearied with the continuous wars and disturbances in which his evil passions involved them, threw off their allegiance 1568, and solemnly elected his brother John to the throne. For nine years the unhappy Eric suffered every indignity at the hands of the keepers appointed by his brother to guard him, and in 1577 he was compelled to terminate his miserable existence by swallowing poison, in obedience to his brother's orders. Strange to say, this half madman was a person of cultivated understanding, and he solaced his captivity with music and the composition of psalms, and in keeping a voluminous journal.

ERIC, *ĕr'ĭk*, THE RED: viking; one of the adventurous Norsemen who settled on the bleak shores of Iceland in 982: son of the Jarl (Eng. Earl) of Jadar: he was named from the color of his hair. He was soon in search of further adventure. Many years before, Gunnbjörn said that he had seen land to the west. Eric determined to take possession of it; and 983, with a party of daring followers, he started from Bredifiord in Iceland, sailed round Cape Farewell, and up the w. coast of the great peninsula or island, to which he gave the name Greenland. To-day the name seems a misnomer; but Eric saw herds of reindeer feeding in meadows, where Julianeshaab now stands. There Eric settled, calling the inlet Ericfiord. He returned to Iceland 985 to enlist fresh adventurers, and then succeeded in reaching Ericfiord with 14 vessels out of a fleet of 25, and built a town several miles up the fiord. The settlement flourished, and colonized several points along the coast. The climate at that time must have been milder, for the chronicles mention trees, and seldom allude to ice.—LEIF ERICSON, son of Eric the Red, was sent out by his father about the year 1000, in charge of an exploring expedition, and discovered the N. American continent, naming one place Markland, which has not been fully identified, but possibly was Nova Scotia; and another part Vinland, from the vines there growing wild, which was probably the s.e. part of New England. He is said to have planted a colony at the latter point, but the evidence has been much disputed. See, on the whole question, Laing's *Heimskringla*.

ERICA, n. *ĕr-ĭ'kă* [L. *ericæus*, of heath or broom—from *ērīcĕ*, heath]: a genus of beautiful and interesting plants, ord. *Ericācĕæ*, or heath family, mostly natives of Cape of Good Hope.

ERICALES, n. *ĕr-ĭ-kā'lēz* [mod. L. *erica*]: in *bot.*, alliance of hypogynous exogens with dichlamydeous flowers, symmetrical in the ovary, axile placentæ, definite stamens, and embryo inclosed in a large quantity of fleshy albumen. Lindley includes under it five orders, *Humiriaceæ*, *Epacridaceæ*, *Pyrolaceæ*, *Francoaceæ*, *Monotropaceæ*, and *Ericaceæ*.

ERICEÆ, *ē-rī′sē-ē*, or ERICACEÆ, *ĕr-ĭ-kā′sē-ē:* nat. ord. of exogenous plants, consisting chiefly of small shrubs, but containing also some trees. The leaves are opposite or in whorls, entire, destitute of stipules, often small, generally evergreen and rigid. The flowers are sometimes solitary in the axils of the leaves, sometimes grouped in different modes of inflorescence, and are often of great beauty, in which respect no order of plants excels this; the beauty of the smallest species, and of those which have very small flowers, rivalling that of others which are trees profusely covered with magnificent clusters. About 900 species of this order are known, of which the greater number are natives of s. Africa, which particularly abounds in the genus *Erica*, and its allies—the true heaths (q.v.)—though some of them are found also at the utmost limits of northern vegetation. They are rare within the tropics, and occur only at considerable elevations. Few species are found in Australia. Many of the ericeæ are *social* plants, and a single species sometimes covers great tracts, constituting the principal vegetation. This is most strikingly exemplified in the heaths of Europe and the n. of Asia. Medicinal properties exist in some of the ericeæ, as the BEARBERRY (see ARBUTUS), and the GROUND LAUREL, of N. America (*Epigæa repens*), (see EPIGÆA REPENS), a popular remedy in the United States for affections of the bowels and urinary organs. Narcotic and poisonous qualities are frequent. See ANDROMEDA: AZALEA: KALMIA: LEDUM: RHODODENDRON. The berries of some species are edible (see ARBUTUS: GAULTHERIA), though none are much esteemed.—The RHODODENDREÆ, classed sometimes as an order, are classed usually as a sub-order of ericeæ, containing genera *Rhododendron*, *Azalea*, *Kalmia*, *Ledum*, etc.: to it belong generally the larger plants of the order, also many small shrubs of sub-arctic regions.

ERICHSEN, *ĕr′ĭk-sĕn*, JOHN ERIC, M.D., F.R.S., LL.D.: eminent English surgeon and author; b. London, 1818. He was educated at the Mansion House, Hammersmith, and at University College, London; was appointed sec. to the physiological section of the British Assoc. for the Advancement of Science 1844; took the Royal Humane Society's gold medal with an essay on *Experimental Inquiry into the Nature and Treatment of Asphyxia* 1845; was appointed prof. of surgery and of clinical surgery in University College and surgeon to the hospital 1850; was a member of the royal commission on vivisection 1875; was pres. of the surgical section of the great international medical congress 1881; and was the unsuccessful candidate for parliament from the universities of Edinburgh and St. Andrew's 1885. He has been pres. of the Royal College of Surgeons of England and of the Royal Medical and Chirurgical Soc., was surgeon-extraordinary to Queen Victoria, and is a member of the principal surgical and scientific societies of the world. His *Science and Art of Surgery* has been translated into almost every known language.

ERICHT, *ĕr′ĭcht* (or Er′rocht), Loch: in the n.w. of Perthshire and s. of Inverness-shire, in an uninhabited district, the wildest and most inaccessible in Scotland, amid the Grampian Mountains. Its banks rise steeply from the water's edge. It is 14 m. long, nearly a mile broad, and extends s.w. from near Dalwhinnie, on the Dunkeld and Inverness road. By one outlet it joins Loch Rannoch, and by another it runs into Lock Lydoch, its waters ultimately reaching the Tay. It is about 1,500 ft. above the sea, and it never freezes. In a cave at the s. end of the loch, Prince Charles lay hid 1746.

ERICHTHIANS, n. *ĕ-rĭk′thĭ-anz* [Gr. *erion,* wool; *ichthus,* fish]: English name for the tribe of unicuirassiated stomapod crustaceans, the type of which is Erichthys. Erich′thys, n. *-thĭs,* genus of stomapoda. It contains the glass-shrimps.

ERICHTHONIUS, in Greek mythology, the son of Dardanus and Bateia, and grandson of Zeus. He obtained the kingdom of Troy by the death of his brother Ilus without children. He married Astyoche, the daughter of Simos, by whom (or according to some by Callirrhoë, the daughter of Scamander) he became the father of Tros. The myth or tradition of Erichthonius is sometimes blent or confused with that of Erectheus.

ERICINONE, n. *ĕ-rī′sĭ-nōn* [L. *erica;* Eng. *quinone*]: in *chem.,* crystalline substance obtained by dry distillation of ericaceous plants. It has been found identical with hydroquinone, $C_6H_4(OH)_2$·(1·4): see Hydroquinone.

ERICSON, Leif, *līf ĕr′ik-sŏn*: Icelandic discoverer. According to Sagas he was the son of Eric the Red (q.v.) and at the beginning of the 11th century discovered a transatlantic country, which he called Vinland, from the vines which abounded there. Here an Icelandic settlement was established, but whether the coast was Labrador, Newfoundland or some region farther south has not been decided. A much idealized statue of Leif Ericson adorns Commonwealth Avenue, Boston, the work of Miss Anne Whitney, the sculptor.

ERICSSON, *ĕr′ĭk-son,* John, ll.d.: 1803, July 31—1889, Mar. 8; b. Langbanshyttan, Sweden: engineer. He studied some time with a German officer of engineers; spent most of his time examining the machinery in his father's mines; was appointed a cadet in the corps of mechanical engineers when 12 years old, and a leveller on the great Swedish ship canal when 13; entered the army as ensign 1820; was promoted capt. 1827; and soon afterward resigned. His early inventions included a condensing-flame engine, a line-engraving machine, an instrument for sea-soundings, a hydrostatic weighing-machine, a tubular steam-boiler, and artificial draught by centrifugal blowers. He built the locomotive *Novelty* to compete with George Stephenson's *Rocket,* and invented and built a steam fire-engine 1829; introduced link motion for reversing locomotives 1830; perfected the

famous caloric engine 1833, and built a vessel of 2,000 tons and propelled it with this motor 1853; invented the screw propeller, which revolutionized steam navigation, 1836; came to the United States 1839; and designed the screw-propelled war vessel, *Princeton*, with machinery below the water line 1841. Much of the machinery and all its arrangement were designed by him, and he also introduced numerous mechanical novelties and a 12-inch wrought-iron gun, with a similar carriage, which took up the recoil without breeching. He received the prize medal of the world's fair, London, for a variety of philosophical devices 1851; offered Napoleon III. the plans for a partially submerged iron-clad, revolving-turret war vessel 1854; and built for the U. S. govt., in 100 days, the little iron-clad *Monitor*, which defeated the Confederate iron-clad *Merrimac* in Hampton Roads 1862, Mar. 9. A fleet of monitors was soon built and did important service during the remainder of the War. In 1869 he built a large fleet of steam gun-boats for the Spanish government, with which to guard Cuba; 1881 devised the war vessel *Destroyer* and her 16-inch submarine gun. He received his degree from Wesleyan Univ. 1862. Amid a great naval pageant in New York harbor, ordered by the U. S. govt., his remains were placed on board the new U. S. crusier *Baltimore* 1890, Aug. 23, for transportation to Sweden, where they were received and interred with equally impressive public ceremonies. The centenary of his birth, 1903, July 31, was observed in New York by the unveiling of a bronze statue of the inventor in Battery Park and in Worcester, Mass., which has a Swedish population of 2,000, by public orations and eulogies.

ERIE, *ē′rĭ:* city, of Erie co., Penn.; on Lake Erie, between Buffalo and Cleveland; on the Lake Shore railroad; at terminus of the Philadelphia and Erie and the Erie and Pittsburg railroads; 117 m. n. of Pittsburg. Erie is on a bluff, having a grand view of the lake, is laid out with broad streets, and has several large and attractive parks. It is lighted with gas and electricity, has electric street railroads, and a good water supply forced from the lake to the top of a tower 200 ft. high, and thence distributed through the city. The particularly advantageous location of Erie has given it high rank as a shipping and manufacturing point. It is in the small part of the state that touches the lake, and it has the largest land-locked harbor on Lake Erie. The harbor has been greatly improved by the federal govt., and is now 5 m. long by 1 m. wide, depth 9 to 25 ft. Presque Isle, lying directly in front of the city, furnishes the means of ample protection. Two light-houses stand at the entrance to the harbor; and substantial wharves, where merchandise is transferred directly from vessels to cars, extend along the entire front. 1900, there were 644 manufacturing establishments, employing $20,418,016 in capital, 9,339 hands, paying $4,574,625 in wages, and yielding products valued at $19,053,202. The principal indus-

tries are manufactures of iron, including steam-engines, machinery, car wheels, car works and stoves, representing $6,541,349 in annual value of products; and planing mill products valued at $768,549 annually; beside brick, leather, organ, pump, furniture, and various kinds of wook-work factories, flouring and grist mills, carpentering establishments, and malt houses. Leading articles of shipment are lumber, bituminous and semi-bituminous coal, iron ore, petroleum, and manufacturing products. The city is governed by a mayor, a select council, and a common council. The expenditure for maintenance and operation annually is about $440,000, including $140,000 for schools. The educational system comprises a high school and over 50 grammar, primary and evening schools. E. has many fine churches, the denominations represented according to numerical strength ranking as follows: Catholic, Presbyterian, Meth. Episc., Prot. Episc., German Evang., Lutheran, Bapt., Hebrews, Evang. Lutheran, Ref. Ger. Ev. Luth., Unit. Brethren, and Universalist. E. is the see of a Roman Cath. bp., who has under his control St. Joseph's orphan asylum, St. Vincent's hospital, a Benedictine priory, St. Benedict's convent and St. Benedict's (female) Acad. The Young Men's Christian Assoc. is an active organization, with a library of several thousand vols. The public buildings include a custom house, marine hospital, city hospital, and jail. On the site of E. the French built a fort prior to 1749, known as Fort de la Presque Isle. A town was laid out 1795, a portion incorporated as a borough 1805, and the whole granted a city charter 1851. Pop. (1900) 52,723. See ERIE, BATTLE OF LAKE.

ERIE, BATTLE OF LAKE: naval conflict, 1813, Sep. 10, between the United States and Great Britain near the Bass Islands, at the w. extremity of the lake, 36 m. e. of Toledo. In the early part of the war Lieut. Oliver Hazard Perry, U.S.N., was placed in command of the American forces on the lake, with instructions to fit out a squadron of 9 vessels, for the maintenance of the naval supremacy of all the lakes. He built and equipped at Erie, Penn., the *Lawrence*, *Niagara*, *Caledonia*, *Scorpion*, *Ariel*, *Somers*, *Porcupine*, *Tigress*, and *Trippe*, having a total of 54 guns and 490 officers and men. Though Erie was blockaded by the British fleet at the time, Perry succeeded in getting egress for all his vessels, and proceeded to Put-in-Bay, near Sandusky. On Sep. 10 he discovered a British fleet of 6 vessels, the *Detroit*, *Queen Charlotte*, *Lady Provost*, *Hunter*, *Chippeway*, and *Little Belt*, lying in the offing, and immediately sailed to meet it. On the American side the *Lawrence* and *Niagara*, and on the British the *Detroit* and *Queen Charlotte* were regular vessels of war, the rest were small vessels hastily armed for warfare. The British vessels carried a total of 63 guns and 502 officers and men. The engagement was

opened by the British, who directed their fire upon the *Lawrence* with such effect that within a short time all her guns were disabled and only 18 out of her force of 101 officers and men remained alive and uninjured. Perry then left the *Lawrence* in a small boat under heavy fire, and took command of the *Niagara*, and bringing his vessels together, passed through the line of British vessels, gave them a raking cross fire, and in 7 minutes compelled the surrender of the 4 principal opponents. The other 2 attempted to escape, but were pursued and captured an hour later. The battle lasted three hours, and the losses on each side were about 130 in killed and wounded, the British commander, Barclay, being among the latter. When Perry saw that victory was assured, he sent the memorable dispatch to Gen. Harrison: 'We have met the enemy and they are ours.'

ERIE, LAKE: most southern of the 5 great lakes drained by the St. Lawrence river; forming part of the boundary between the United States and Canada; bounded n. by the province of Ontario, Canada; s.e. and s. by N. Y., Penn., and O., and w. by Mich.; between lat. 41° 25′—42° 55′ n. and long. 78° 55′—83° 34′ w.; greatest length 290 m., greatest breadth 57 m., mean 40 m.; circumference 660 m.; greatest depth 312 ft., mean 120 ft.; surface elevation above sea level 565 ft.; area abt. 10,000 sq. m. It is the shallowest lake in the cluster, receives most of its water from Lakes Superior, Michigan, and Huron through the Detroit river, and has a surface 334 ft. higher than that of Lake Ontario, the descent being made in the connecting Niagara river. Beside the Detroit, the principal rivers emptying into it are the Maumee, Sandusky, Raisin, and Cuyahoga. It has several natural harbors that have been rendered valuable by govt. improvements, among which those of Erie, Penn., Dunkirk and Buffalo, N. Y., Cleveland, Sandusky, and Toledo, O., and Ports Maitland, Dover, Burwell, and Stanley, on the Canadian side, are the most important. L. E. occupies a very important position in the channel of trade and steam navigation. Large vessels can pass from it through the Welland canal into Lake Ontario, and thence by the St. Lawrence river and gulf into the Atlantic Ocean, while smaller ones can gain a lower ocean point by entering the Erie canal at Buffalo and the Hudson river at Albany, and making their way thence to New York. Both routes, however, are closed by ice three months during each year. On the other hand, the railroad facilities of its American ports are exceptionally large, and afford an uninterrupted communication with all parts of the United States. Customs districts are maintained by the U. S. govt. at Buffalo and Dunkirk, N. Y., Erie, Penn., and Cuyahoga, Miami, and Sandusky, O. At the w. extremity and near the mouth of the Detroit river, the lake contains a number of very fertile and heavily wooded islands, some under cultivation, and the largest having a circumference of abt. 14 m. Of these Point Pelee, North Harbor, East Sister, Middle Sister, and the Hen and Chicken Islands belong to Canada, and Kelly's, North, Middle, and South Bass, West Sister, Green, Sugar, and Rattlesnake Islands to the

BATTLE OF LAKE ERIE.

United States. It was at Put-in-Bay, South Bass Island, that Com. Perry discovered the British fleet under Capt. Barclay, 1813, Sep. 10, and his memorable battle was fought in its immediate vicinity. See ERIE, BATTLE OF LAKE.

ERIE CANAL: largest canal in the United States; commercially one of the most important and structurally one of the most scientific in the world. It extends from Buffalo to Albany, N. Y., 363 m.; was projected as a means of connecting the great lakes with the Hudson river and the Atlantic seaboard at New York, 1810; constructed under the provisions of a bill adopted in the state legislature, 1817; and completed 1825 at a cost of $7,602,000. One of the earliest advocates and most constant promoters of the scheme was De Witt Clinton, who memorialized the legislature in its behalf 1815, and as gov. led an imposing naval demonstration down the Hudson from Albany and wedded Lake Erie to the Atlantic Ocean by pouring into the latter some water from the former, 1825, Oct. Originally it was 40 ft. wide at the surface and 4 ft. deep, but subsequent improvements gave it a surface width of 70 ft., bottom width 42 ft. and depth 7 ft. The flow of water is mostly from w. to e. its w. end at Buffalo being 568 ft. above its e. end at Albany. It is twice carried over Mohawk river on costly stone aqueducts; at West Troy it crosses a ridge 188 ft. high by means of 16 double lift-locks of remarkably skilful construction; and at Albany it is raised 20 ft. by 2 double locks, each 110 by 18 ft. Of the $9,000,000 appropriated in 1895 for canal improvements $6,833,390 was spent on the Erie, and up to 1903 this canal had cost for construction, enlargements, and maintenance $52,540,800. Since then plans involving an outlay of about $82,000,000 have been devised to convert the waterway into a great ship canal, navigable for vessels of 1,000 to 1,200 tons: see CANALS.

ERIGENA, *ē-rĭj′ė-na* or *ĕr-ĭj′ė-na*, JOANNES SCOTUS: the earliest great philosopher of the middle ages; b. probably in Ireland; lived in the 9th c. Very little is known of his history. He appears to have resided principally in France, at the court of Charles the Bald. In the controversies of his time, regarding predestination and transubstantiation, he took part. His philosophic opinions were rather those of a Neo-Platonist, though he was the forerunner of scholastic realism. His love for the mystic doctrines of the old Alexandrian philosophers was shown by his translation of the writings ascribed to Dionysius the Areopagite, which were a well-spring of mysticism during the middle ages. Erigena held that God is the essential ground of all things, from whom all things emanate, and into whom they return again. Pantheism, therefore, lurks in his system. His principal work is *De Divisione Naturæ* (published by Gale, Oxford 1681). One of its leading thoughts is the identity of philosophy and religion, when both are properly apprehended. Erigena uttered

his opinions with great boldness, and he showed no less subtlety and strength of intellect in their defense. He expressed his contempt for theological dogmatism, and vindicated the authority of reason over all other authority. His words are: 'Authority is derived from reason, and not reason from authority; and when the former is not confirmed by the latter, it possesses no value.'

ERIGERON, *ē-rĭj′ė-rŏn:* genus of plants of the nat. ord. *Compositæ*, suborder *Corymbiferæ*, having heads (flowers) of many florets, the florets of the ray numerous, in several rows, of a different color from those of the disk. *E. acris* is European, also a native around and n.w. of L. Superior. There are many N. American species; the most common are the tall, white-rayed Horse-weed, the Robin's Plantain, the Daisy Fleabanes, and the Common Fleabane (*E. philadelphicum*) with innumerable, narrow, rose-purple rays, and said to be used as a diuretic.

ERIN, n. *ē′rĭn* [L. *Ierne*, Ireland, the L. name being itself a probable corruption of an old Celtic term: comp. Gael. *Iar-innis*, the isle of the west, and *Hibernia*, Ireland]: contr. for Ireland, or its ancient name. ERINITE, n. *ĕr′ĭ-nīt*, a beautiful green arseniate of copper found in Limerick, Ireland.

ERINA′CEUS and ERINACE′ADÆ: see HEDGEHOG.

ERINEUM, n. *ĕr-ĭ-nē′ŭm* [Gr. *erineos*, of wool; woolen]: in *bot.*, abnormal development of the cells of the epidermis of trees, specially of the *Amentaceæ*, the *Aceraceæ*, and of the *Rosaceæ*. The cells so developed were formerly mistaken for fungi.

ERINGO: see ERYINGO.

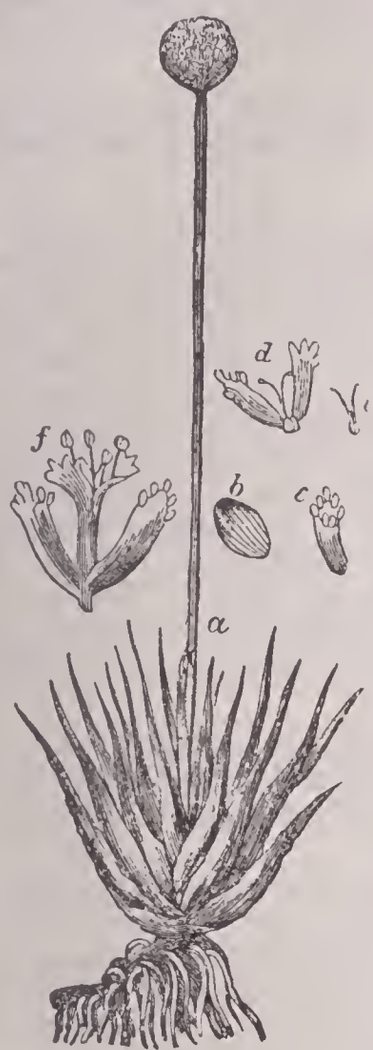
ERINNA, *ē-rĭn′nâ:* Greek poetess, concerning the date of whose birth the most different statements are advanced. According to some, she was the intimate friend of Sappho (hence Erinna likewise is called the Lesbian singer), and was born at Rhodes, or on the little island of Telos, w. of Rhodes; while others maintain that she lived in the age of Demosthenes; and others again, perplexed by such a wide difference in point of time, have recourse to the hypothesis of two poetesses of this name. Erinna acquired such celebrity by her epic, epigrammatic, and lyric poems, that her verses were compared with those of Homer, though she died at the early age of 19. The genuineness of the fragments that exist under her name has been disputed on good grounds. These have been collected by Schneidewin in the *Delectus Poesis Graecæ Elegiacæ* (Göttingen 1838).

ERINNYS, or ERINNYES: see EUMENIDES.

ERIOBOT′RYA: see LOQUAT.

ERIOCAULACEÆ, *ĕr-ĭ-ō-kaw-lā′sē-ē:* nat. ord. of endogenous plants, nearly allied to *Restiaceæ*, containing about 200 known species, many of which are aquatic or marsh plants. The Eriocaulaceæ are natives chiefly of the tropical

parts of America and Australia. One species, *Eriocaulon septangulare*, JOINTED PIPEWORT, is found in the w. of Ireland, and in some of the Hebrides; a little grass-like plant, growing in lakes which have a muddy bottom, and exhibiting small globular heads of flowers. It is interesting from its botanical affinities, and with reference to geographical distribution. The E. form a remarkable feature of the vegetation of some parts of S. America; but many of the species bear little resemblance to their humble northern congener, being almost shrubby, 4–6 ft. high, with leafy, much branched stems, 'each branchlet terminated by a large white ball, composed of a vast number of smaller heads, placed on peduncles of unequal length.' Many grow on arid mountainous regions; others in flat sandy grounds, flooded in the wet season.—Gardner's *Travels in Brazil*.



Jointed Pipewort (*Eriocaulon septangulare*):

a, tuft of leaves, flower-stalk with flowers, and part of creeping root; *b*, seed; *c*, bract or scale; *d*, female flower; *e*, pistil; *f*, male flower.

ERIOCEPHALUS, n. *ĕr-ĭ-o-sĕf'-a-lŭs* [Gr. *erion*, wool; *kephalē*, the head]: in *bot.*, typical genus of *Eriocephaleæ*, a sub-tribe of *Asteraceæ*, tribe *Senecioideæ*.

ERIODENDRON, *ĕr-ĭ-ō-dĕn'-drŭn:* genus of trees of the nat. ord. *Sterculiaceæ*, natives of tropical countries. Their thick woody capsules contain a kind of wool surrounding the seeds; hence the trees are sometimes called WOOL-TREES. The wool of *E. Samanna* is used in Brazil for stuffing pillows. *E. anfractuosum*, of which one variety, found in the E. Indies, is sometimes called *E. Indicum*, and another found in Africa, *E. Guïneense*, is a tree of great height, 150 ft. or more. The African variety or species is called RIMI and BENTANG. Park mentions it by the latter name. Barth says it is generally seen growing near the principal gate of large towns in Hansa. Its wood is soft and spongy, used chiefly for making canoes. The seeds of *E. Indicum* are eaten in Celebes. They are roundish, and of the size of peas. The trees of this genus have palmate leaves. The flowers are large and beautiful.

ERIOGONUM, n. *ĕr-ĭ-ŏg'o-nŭm* [Gr. *erion*, wool; *gonu*, the knee, a joint of a plant]: typical genus of *Eriogoneæ*, a tribe of *Polygonaceæ*.

ERIOLÆNEÆ, n. *ĕr-ĭ-o-lē′nē-ē* [mod. L. *eriolæna*]: a tribe of *Byttneriaceæ*.

ERIOMETER, n. *ĕr-ĭ-ŏm′ĕ-tėr* [Gr. *erion*, wool; *metron*, a measure]: instrument for measuring the diameter of small fibres, such as wool, cotton, or flax, by ascertaining the diameter of any one of the colored rings which they produce.

ERIOMYS, n. *ĕr′ĭ-o-mĭs* [Gr. *erion*, wool; *mus*, a mouse]: in *zool.*, genus of *Chinchillidæ*. *E. laniger* is the chinchilla.

ERIOPHORUM, n. *ĕr-ĭ-ŏf′ėr-ŭm* [Gr. *erion*, wool; *phoros*, bearing]: in *bot.*, cotton-grass; genus of *Cyperaceæ* (sedges), tribe *Scirpeæ*. It consists of perennial tufted herbs, with many flowered spikelets; the glumes imbricated on every side, and several hypogynous bristles, becoming very long and silky. The common *E. angustifolium* is reduced by Sir Joseph Hooker to a variety of *E. polystachyon*. *E. vaginatum* is the Hare-tail, *E. alpinum* the Alpine, *E. polystachyon* includes both the Broad and the Narrow-leaved, and *E. gracile* is the slender Cotton-grass. The silk or cotton from the English species of the genus has been made into paper and the wicks of candles, or used for stuffing pillows. The immature leaves of a Himalayan species, *E. comosum* or *cannabinum*, are used for rope-making.

ERIPHIA, n. *ĕ-rĭf′ĭ-a* [L. *eriphia;* Gr. *erepheia*, an unknown plant]: in *zool.*, genus of decapod short-tailed crustaceans. *Eriphia spinifrons* is widely diffused in different seas.

ERISMA, n. *ĕ-rĭz′ma* [Gr. *erisma*, a cause of quarrel; *erizō*, I strive; *eris*, strife: so called from the anomalous character of the structure first described and the genus of *Vochyaceæ*]: in *bot.*, the rachis or axis of grasses. Erisma is also a genus of S. American *Vochyaceæ*. *E. Japura* is the Japura of Brazil, a fine tree, 80 to 120 ft. high.

ERITREA, *ā-rē-trā′a*, or ERYTH′RÆA (from Gr. *erythros*, red, referring to the Red Sea), the official name of an Italian colonial possession stretching along the African shore of the Red Sea from Cape Kasar in lat. 18° 2′ N. to the Sultanate of Raheita on Bab-el-Mandeb in lat. 12° 30′ N. The coast-line is between 500 and 600 miles in length, and the area of the colony is about 94,800 square miles. The chief town is Massowah. Pop. of the colony about 400,000, the majority of whom are Arabs.

ERIVAN, or ERIWAN, *ĕr-ė-vân′*, or IRWAN: govt. of Russia in Transcaucasia; bounded by Georgia, Persia, and Turkish Armenia; watered principally by the Aras or Araxes river. It abounds in gold, silver, other minerals, and salt, and contains the celebrated Mt. Ararat. More than one-quarter of the population are tribes of nomadic gypsies of Mohammedan faith, the remainder are pure Armenians. Cap. Erivan. Pop. of govt. 804,757; of capital 15,040.

ERLANGEN, *ĕr'lâng-ėn:* town of Bavaria, in a well-cultivated district, on the right bank of the Regnitz, 10 m. n. of Nürnburg. It is a handsome town, surrounded by walls pierced by seven gates; its streets—a great number of which were erected after 1706, when a fire consumed a large portion of the town—are straight and regular. It is divided into the Old and New Towns, the latter founded 1686 by Christian, markgraf of Bayreuth. Erlangen is the seat of a univ., of a gymnasium, of agricultural and industrial schools, and other institutions. Erlangen became a Bavarian possession by the treaty of 1809. Pop. 17,559.

ERLANITE, n. *ėr'lan-īt* [named from *Erla* in the Saxon Erzgebirge, where it is found]: in *min.*, light greenish-gray mineral or rock containing silica, alumina, lime, etc. At first it was considered a mineral, but Dana believes it to be a rock.

ERLAU, *ĕr'low* (Hung. *Eger*): episcopal city of Hungary, county of Heves, of which it is cap.; on both banks of the river Erlau, in a delightful valley skirted with vine-clad hills. It is surrounded by old walls pierced by six gates; has four suburbs, in which the greater portion of the inhabitants dwell; and though in general its streets are narrow and have a neglected appearance, it is rich in fine public buildings. The principal of these are the Lyceum, with a valuable library, and an observatory 172 ft. high; the recently built cathedral, the episcopal palace, the Franciscan and the Minorite monasteries, a richly embellished Greek church, a county hall, and the new barracks. Erlau has also a gymnasium, an episcopal seminary, a normal and drawing school, a hospital founded 1730, and other important institutions. Pop. 22,427.

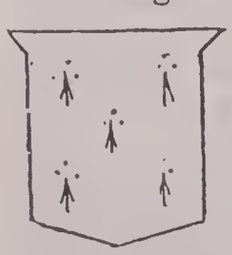
ERLKÖNIG, *ĕrl-kö'nĭch* [Elf-king]: German name of a poetical, personified, natural power which, according to German poetical authorities, prepares mischief and ruin for men, and especially for children, through delusive seductions. The name, not connected with the root *erle*, is synonymous with Elfen König. The Erlkönig was introduced into German poetry from the Sagas of the North, through Herder's translation of the *Erlkönig's Daughter* from the Danish, and has become universally known through Goethe's ballad of the *Erlkönig.*

ERMINE, n. *ėr'mĭn* [OF. *ermine;* F. *hermine*—from mid. L. *armēnĭŭs*, a fur of Armenia], (*Mustela erminea*): the stoat, a species of weasel (q.v.), considerably larger than the common weasel, but much resembling it in general form and other characters, and in habits. The E. is almost ten inches in length, exclusive of the tail, which is fully four inches and a half long. It is of a pale reddish-brown color in summer, the under parts yellowish-white, the tip of the tail black: in winter—in cold countries or severe seasons—the upper parts change to yellowish-white or almost pure white, the tip of the tail, however, *always* remaining black. This change takes place more frequently in northern than in southern localities, but sometimes even

in the south of England; and when it is only partially accomplished, the animal has a piebald appearance, and often remains so during the milder winters. It is in its winter

Ermine:
Summer and winter dress.

dress that it is called E., and yields a highly valued fur; more valuable, however, when obtained from the coldest northern regions than from temperate countries. In its summer dress it is called Stoat. It displays indomitable perseverance in the pursuit of its prey, which consists very much of rats, water-voles, and other such small quadrupeds; with young hares and rabbits, grouse, partridges, etc. The eggs of birds are as welcome to it as the birds themselves. The E. is a native of all the n. parts of the world. Its range extends even to the s. of Europe. It delights in Moorish districts, and is abundant in the n. of Scotland. It is from Norway, Lapland, Siberia, and the Hudson's Bay territories that the E. skins of commerce are obtained, used not only for ladies' winter garments, but for the robes of kings and nobles, and for their crowns and coronets. E. has thus obtained a distinct recognition in heraldry. Being used for the robes of judges, it has come to denote the judicial office or dignity, and to be an emblem of purity and honor without stain. In making up E. fur, the tails are inserted in a regular manner, so that their rich black shall contrast with the pure white of the rest of the fur.—*Ermine,* in *heraldry,* white fur, with black spots; the reverse of which, or a black fur with white spots, also used in heraldry, is called *Contre Ermine.* Ermine is commonly used to difference the arms of any member of a family who is connected with the law. A cross composed of four ermine spots is said to be a Cross Ermine. ER'MINED, a. *-mĭnd,* adorned or clothed with ermine.



Ermine.

ERNE, *ėrn:* river and lake in the s.w. of Ulster province, Ireland. The river rises in the s. of Cavan county, in the small but beautiful Lough Cowna. It runs n. and n.w.,

merging in Lough Oughter, in Cavan county, and in Lough Erne in Fermanagh county, and passes Enniskillen and Ballyshannon. It then flows through the s. corner of Donegal county into Donegal Bay; total course 72 m. On the river, at Ballyshannon, is a salmon-leap fall, over a rocky ledge 20 ft. high and 150 yards broad, and the river leaps over another rocky ledge near Belleek, 2½ m. below the lower end of the loch. Lough Erne, one of the finest lochs in the kingdom, is the most attractive feature of Fermanagh county, which it bisects lengthways, and almost entirely drains. It extends 40 m. from s.e. to n.w., and consists of two lakes, the upper and lower, joined by a narrower part 10 m. long, and assuming in parts the character of a river, with Enniskillen midway between the two lakes. The Upper Lough is 12 by 4 m. in extent, 10 to 75 ft. deep, 151 ft. above the sea, and has 90 green hilly islets. The Lower Lough is 20 by 7½ m. in extent, 100 to 266 ft. deep, 148 ft. above the sea, and has 109 islets. On one of the islets is a round tower. The waters contain salmon, trout, pike, bream, and eels. The scenery is singularly varied and beautiful.

ERNE, *ĕrn* (*Haliæëtus*): genus of birds of the family *Falconidæ*, and of the eagle group; differing from the true eagles in the greater length of the bill, in the toes and lower part of the tarsi being destitute of feathers, and generally, also, in frequenting the sea-coast and the banks of lakes and rivers to feed on fish, in feeding like vultures on carrion almost as readily as on newly killed prey, and in inferior courage. The northern hemisphere has the COMMON E. (*H. albicilla*), known also as the Sea Eagle or

Common Erne (*Haliæëtus albicilla*).

White-tailed Sea Eagle. It is much more common in Britain than the Golden Eagle, is sometimes seen even in the s. of England and in inland districts, occasionally visiting deer-parks to prey on very young fawns or to

devour dead deer; but is more frequent in the n. of Scotland, doing considerable injury to flocks in Sutherlandshire, particularly during the season of young lambs. Its favorite haunts, where it roosts and makes its nest, are the shelves and ledges of stupendous precipices on the coast, where its scream often mingles with the noise of the perpetual surge. It sometimes also breeds on crags beside inland lakes, as at the Lakes of Killarney, and more rarely even on trees. Fishes are certainly its favorite food, though its mode of procuring them is not well known; but water-fowl also are its very frequent prey. It is found in most parts of Europe, and even in the islands of the Mediterranean, but is more abundant in the n. of Europe and Siberia. It occurs in N. Amer. only in Greenland. In size, the E. is inferior to the Golden Eagle, being seldom more than 33 inches in its whole length. The general color of the plumage is brown, the head having a paler yellowish tinge, the tail in the adult bird is pure white. The young, called sometimes the Cinereous Eagle, has a grayer plumage and mottled tail.—Another notable species of this genus is the WHITE-HEADED E. (*H. leucocephalus*) of America, called also the White-headed Eagle, Bald Eagle, and Sea Eagle, the chosen symbol of the United States. It is a bird of about the same size with the Common E., with dark-brown plumage, and—in an adult state—the head, neck, tail, and belly white. It is found in almost all parts of N. America, visiting the arctic regions in summer, but abounding chiefly in the southern states between the Atlantic and the Mississippi. It frequents both the sea-coast and the lakes and rivers, and may be often seen sailing through the column of spray at the Falls of Niagara. It is very fond of fish, which it procures by wading in shallow streams, and also by compelling the osprey to relinquish prey just taken. The soaring and evolutions of the birds in the air on such occasions are described as sublime. The White-headed E. feeds also on lambs, fawns, poultry, etc.; kills swans, geese, and other water-fowl; and does not disdain to compel vultures to disgorge for its use the carrion which they have swallowed. On account of its habits and dispositions, Franklin expressed his regret that it had been chosen as the symbol of his country. A Bald Eagle, of large size and young coloring, was named by Audubon the Bird of Washington (*H. Washingtonii*).—Australia produces a beautiful species (*H. leucogaster*), and numerous species are found in other parts of the world, among which are some of comparatively small size, as the PONDICHERRY KITE, or BRAHMANY KITE (*H. ponticerianus*) of India, constantly seen fishing like a gull in the rivers of that country, and by the Hindus considered sacred to Vishnu.

ERNESTI, *ĕr-nĕs'tē*, JOHANN AUGUST, 1707, Aug. 4—1781, Sep. 11; b. Tennstädt, in Thüringia: theologian and philosopher. He studied at Pforta, Wittenberg, and Leipsic; but after having been appointed rector of the Thomas-school in Leipsic, 1734, turned his attention chiefly to the old classic literature, and the studies connected with it.

In 1742, he became prof. extraordinary of ancient literature in the Univ. of Leipsic, in 1756 prof. of rhetoric, in 1759 prof. of theology. E. paved the way to thelogical eminence by a thorough study of philology, and was thus led to a more correct exegesis of the biblical authors, and to an interpretation less hampered by theological opinion. Mainly to him is due the present method of theological exposition, so far as it rests upon correct grammatical elucidation. He showed his ability as an accurate critic and grammarian, in his editions of Xenophon's *Memorabilia of Socrates;* the *Clouds* of Aristophanes, *Homer, Callimachus, Polybius, Suetonius,* and *Tacitus;* but above all, by his admirable edition of Cicero (5 vols. Leip. 1737–39), to which he added a *Clavis Ciceronia,* by way of supplement. He was also the first reviver of true and manly eloquence in Germany. His theological writings are numerous. The most remarkable are the *Initia Doctrinæ Solidioris,* the *Institutio Interpretis Novi Testamenti* (translated into English), the *Anti-Muratorius* (1755), and the *Opuscula Theologica* (1792). Compare Bauer, *Formulæ ac disciplinæ Ernestianæ indoles* (1782); Stallbaum, *Die Thomas-schule zu Leipzig* (1839).

ERNST, *ĕrnst,* Elector of Saxony: d. 1486: founder of the Ernestinian line, or the elder branch of the princely House of Saxony. He was the elder son of the Elector Friedrich the Mild, and of Margaret, Archduchess of Austria. When only 14 years of age, he was seized and carried off from the castle of Altenburg, with his brother Albrecht, but was speedily recaptured. This incident, known in German history as the Stealing of the Princes (*Prinzenraub*), was described with extraordinary vividness by Carlyle in the *Westminster Review,* 1855, Jan. He succeeded to the electoral dignity on the death of his father 1464, but governed in common with his brother for 21 years. In 1485, however, E. and Albrecht divided the paternal possessions, when the former obtained as his share Thuringia, the half of the district then called Osterland, with Voigtland, the Franconian estates of the House, the electoral dignity, and the dukedom of Saxony. E. took great interest in the welfare of his people. Against injustice, tyranny, and lawlessness, he was implacable. He died at Kolditz. It is next to impossible to trace the course of the Ernestinian line through the labyrinthine mazes of the endless German genealogies; it is sufficient to say that after 1638 the Ernestinian line was represented by the Dukes of Weimar, who gradually obtained the whole possessions of the House. Johann, Duke of Weimar (d. 1605), left several sons, the eldest of whom, Wilhelm, became founder of four different branches, all, however, reunited under Ernst August, Duke of Weimar (d. 1748). After 1815, the duchy of Weimar became the grand-duchy of Saxe-Weimar-Eisenach, and its present ruler is of course the direct representative of the Ernestinian line. The other three families by which also it is now represented are those of Meiningen Saxe-Coburg-Gotha, and Altenburg.

ERNST I., surnamed the Pious: Duke of Saxe-Gotha and Altenburg, founder of the House of Gotha; 1601, Dec. 24—1675; b. at the castle of Altenburg; son of Johann, Duke of Weimar (d. 1605); thus connected with the main Ernestinian line. E. was the ninth of ten brothers, the youngest of whom was the famous Bernhard (q.v.) von Weimar. He received an excellent education from his mother, Dorothea Maria von Anhalt. After the arrival of Gustavus Adolphus in Germany, E. entered the Swedish service, and in various engagements showed great courage and skill, completing the victory of the Protestants at Lützen, after the fall of Gustavus. After the battle of Nördlingen, 1634, Aug. 26, E. withdrew from the theatre of strife, and for the rest of his life applied himself to restoring the prosperity of his territories, frightfully devastated during the Thirty Years' War. Of his seven sons, the eldest, Friedrich, continued the line of Gotha, while the third became the founder of the House of Meiningen, and the seventh, the founder of the House of Saalfeld. E. is a fine type of the old German Prot. prince. Zealously attached to the doctrines and government of the Lutheran Church, he exercised a constant watch over its religious and educational interests. With the formalism, however, that often characterizes 'strictly religious' people, he compelled his children to learn the whole Bible by heart. He was much interested in the advance of Christianity abroad, and invited to his court the Abbot Gregorius from Abyssinia, besides sending thither on a religious embassy Joh. Mich. Wansleb of Erfurt. He also carried on a correspondence with the king of Ethiopia and the Patriarch of Alexandria. His line became extinct by the death of Friedrich IV. 1825.

ERNST II. (August Karl Johannes Leopold Alexander Eduard): Duke of Saxe-Coburg-Gotha; b. Coburg, 1818, June 21; elder brother of the late Prince Albert (q.v.). Both brothers received an admirable literary and scientific education. The family to which E. belongs is a branch of the Ernestinian line, having been founded 1680 by Albrecht, second son of Ernst the Pious (q.v.). When E. had completed a university curriculum at Bonn, he entered the military service of the king of Saxony, but left it on his marriage with the daughter of the Grand-duke of Baden. In 1844, E. succeeded his father as Duke of Saxe-Coburg-Gotha. In his opinions and aspirations, imbued with the spirit of his age, he has introduced into his little dominions many beneficial reforms, and allayed not a few long-standing jealousies. Yet one regrets to say, that his enlightened views of his duty as a ruler have not been generally appreciated by his subjects. During the stormy period of 1848–9, by spontaneous concessions on the one hand, and on the other by energetic repression of the political anarchists, he succeeded in saving his territories from the perils of revolution. In the Slesvig-Holstein war, E. took a prominent part, and won the Battle of Eckenförde, 1849, Apr. 5. E. was a great advocate for the unity of the German nation, and prominent in most of the efforts made in that direction. His leisure hours are devoted to music and the fine arts.

His operas, *Casilda*, *Santa Chiara*, and *Diana von Solanges*, are well known in Germany. In 1861 he published a pamphlet vindicating his government, and in 1864 an account of a tour in Egypt.

ERNST, Heinrich Wilhelm: 1814–1865, Oct. 8; b. Brünn, Moravia: violinist. He studied at the Vienna Conservatorium. At the age of 16, his talents excited much interest in Germany; and he soon afterward performed in Paris. His first visit to London was in 1843; and he returned in subsequent years, spending the intervals in Paris and in different parts of Germany. His playing was characterized by immense brilliancy, combined with passion and sentiment. He suffered much from acute neuralgia, which latterly interfered with the exercise of his art; and the last seven years of his life were spent at Nice, where he died. Ernst's compositions have generally a bravura character, and include works for the violin and orchestra, quartets, etc.

ERODE, v. *ĕ-rōd′* [L. *erōdĕrĕ*, to consume or eat away—from *e*, out of; *rōdō*, I gnaw]: to eat in or away; to corrode. Ero′ding, imp. Ero′ded, pp.: Adj., in *bot.*, irregularly toothed as if gnawed. Ero′sive, a. *-zĭv* [L. *erōsus*, consumed]: that eats away. Ero′sion, n. *-zhŭn* [F.—L.]: act of gradually wearing away; state of being gradually worn away; influence of a stream or river in hollowing out its channel. Even the smallest streams, running over soft strata, as clay or sand, cut out channels, and remove the eroded materials. Hollows thus produced have been observed in stratified rocks. When the hollows thus abraded are of considerable extent, *'valleys of erosion'* are produced. Many of the earlier geologists held that rivers had hollowed out their own valleys. The immense amount of materials brought down by rivers, and deposited at their mouths as deltas, shows without doubt that they have contributed materially to produce inequalities on the earth's surface; but the examination of the geological structure of valleys, plainly testifies that almost every great hydrographical basin has derived its form originally from some other agency, though its outline may have been much altered by the continued action of currents within it. Erose, a. *ĕ-rōs′*, in *bot.*, irregularly toothed as if gnawed or bitten. Erose′ly, ad. *-lĭ*.

ERODIUM, n. *ĕ-rō′dĭ-ŭm* [Gr. *erōdios*, a heron, to the bill of which the beak of the fruit presents some resemblance]: in *bot.*, stork's bill, genus of *Geraniaceæ*. About 50 species are known, all from the e. hemisphere.

EROPHILA, n. *ēr-ŏf′ĭ-la* [Gr. *ēr*, ear, the spring; *phileō*, I love]: in *bot.*, genus of crucifers, family *Drabidæ*. It resembles *Draba*, but has deeply cloven white petals, etc., seeds numerous in each cell of the pod. *Erophila verna*, formerly called *Draba verna*, is the common Whitlow-grass.

E′ROS: see Cupid.

EROS, in astronomy, one of the minor planets, dis-

covered photographically by Witt in 1898, at the Urania Observatory, Berlin. The orbits of most of the other known asteroids lie wholly beyond that of Mars; but Eros approaches much nearer to the sun, and at times it may be within 14,000,000 miles of the earth. It is this fact which gives the planetoid its great astronomical interest. The relative dimensions of the solar system are known with high precision, and if any dimension can be accurately measured in miles, all the other dimensions become known at once, in terms of the same unit. It is apparently possible to determine the parallax of Eros (and hence its distance from the earth in miles) with relatively high precision, and a correspondingly accurate determination of the absolute dimensions of the solar system in general will result. As Eros approaches the earth more closely than any other heavenly body except the moon, its parallax is relatively large; and the fact that its diameter is only about 20 miles, so that it appears in the telescope as a mere point of light without a sensible disk, indicates that extremely precise micrometric measures of its position on the heavens may be had. Astronomers are keenly alive to the possibilities offered by this seemingly insignificant little planet, and at every favorable opposition Eros will be studied with exceeding care. It is considered probable that by the end of the century the observations of Eros will have led to a determination of the sun's distance that will not be in error by more than 25,000 miles, the present uncertainty in this distance being probably fully 150,000 miles.

ERO'SION, or DENUDATION, the process of slow removal in air or water of the products of rock decay whereby the surface features of the earth are obliterated. It includes the destructive work of winds, of streams, of glaciers, and of the ocean. Its various aspects may be considered under three heads, (1) subaërial; (2) marine, and (3) submarine erosion.

1. Under subaërial erosion comes the action of air and water on all land surfaces above sea-level. Changes of temperature crack off flakes from rock-ledges and reduce them to smaller flakes. Chemical processes, due to moisture and CO_2 in the air, break up the rock-minerals. In a climate with dry seasons the dust may be swept away by the winds (deflation), leaving the larger pebbles. Stony deserts have thus been formed in Arizona and other parts of the world. The dust—charged winds can carve and wear down rock surfaces. Instances are common in the arid regions of the West and in the desert of Sahara.

The erosive action of water begins with the raindrop. Rain washes the soil away from the areas not protected by stones. This action sometimes takes place on a larger scale in semi-arid climates when rock-decay is slow, and curious pillars of earth or soft rock capped by protecting boulders are formed. Examples may be found in the Garden of the Gods, Colorado. When the raindrops

unite to form tiny rivulets the process of river-erosion has begun. Some rock-constitutents are dissolved and borne away in solution; other particles are carried away in suspension and, by abrasion on rocks below, help the stream carve its channel deeper. When the current slackens some of the waste from the higher lands may be deposited, the coarser materials first. Thus mountains are worn down and plains formed. The higher the mountains, the deeper the valleys can be carved; but even the highest mountains are ultimately deeply dissected, and finally worn down so that the current of the river may not be strong enough to transport the detritus. A country thus worn down is said to have reached a base-level of erosion, and its nearly level surface forms a peneplain. If such a region be uplifted, the streams will start work again vigorously, and a new cycle of erosion will begin. A region reduced to its base-level, if neither elevated nor depressed, can remain unchanged through millions of years.

The amount of waste brought down by some rivers is enormous. Thus the Po in flood carries one part sediment to every 300 parts of water; the Ganges one part sediment to 835 parts of water. These may seem small ratios of sediment, but the total amount of material discharged annually by the Ganges is calculated to be 378,100,000 tons, while the Nile annually brings down 150,000,000 tons. The Mississippi annually brings to the Gulf of Mexico 406,250,000 tons of material in suspension, enough to lower its whole basin one inch in 300 years. It is calculated that the average amount of material removed as sediment annually by streams over the whole land surface is 600 tons per square mile.

Marine erosion includes wave-action; great waves strike heavy blows against projecting headlands, and the surf on rocky beaches charged with boulders and stones is a never-ceasing mill. The undertow of waves sweeps out and rearranges the fine material ground from the rocks; tidal currents, often strong, may bear the waste long distances, or scour channels in soft formations. If a land surface be slowly sinking, the advancing ocean levels the rock ridges and hills. Submarine erosion, the work done by ocean currents, is of little importance, since these currents are seldom strong enough to abrade rocks. The erosive work of ice differs from that of running water in several particulars and is considered (see GLACIER) separately. Consult: Lyell, *Principles of Geology* (1872); Geikie, *Handbook of Geology* (1893); Dana, *Manual of Geology* (1895); Gilbert, *Geology of the Henry Mountains* (monograph U. S. Geological Survey 1877); Powell, *Exploration of the Colorado River* (1875); Penck, *Morphologie der Erdoberfläche* (1894); Davis, *Physical Geography* (1901). See GEOLOGY; MOUNTAIN; PHYSICAL GEOGRAPHY; PHYSIOGRAPHY; CONTINENT; RIVER; SHORE; etc.

EROSTRATUS: see HERODSTRATUS.

EROTIC, a. *ĕ-rŏt′ĭk* [Gr. *erōtikŏs*, relating to love—from *erăō*, I love passionately; *ĕrōs*, love]: relating to the passion of love; produced by love; designating love-songs; also EROT′ICAL, a. *-ĭ-kăl*. EROTOMANIA, n. *ĕ-rŏt′ō-mā′nĭ-ă* [Gr. *manĭă*, madness]: madness produced by love (see MANIA). EROT′OMA′NIAC, n. *-nĭ-ăk*, one who is mad from love.

EROTYLIDÆ, n. *ĕr-o-tĭl′ĭ-dē* [L. *erotylus*, an unknown precious stone; Gr. *erōtulos*, a darling; a sweetheart, from the beauty of some of the species]: in *entom.*, family of tetramerous beetles, with very gibbous bodies, found in fungi. EROTYLUS, n. *ē-rŏt′ĭ-lŭs*, the typical genus of the family *Erotylidæ*.

ERPENIUS, *ĕr-pē′nĭ-ŭs* (Latinized from Thomas van Erpen): 1584, Sep. 7—1624, Nov. 13; b. Gorkum, Holland: early Orientalist. At an early age, he was sent to Leyden, where he directed his attention first to theology, afterward particularly to Oriental languages. After travelling through England, France, Italy, and Germany, he became prof. of Oriental languages at Leyden, 1613. Here he erected an Arabic press in his own house, caused new types to be cut, and not only wrote but printed a great number of important works bearing on his favorite studies. The professorship of Hebrew not being vacant at the time of E.'s translation to the Univ. of Leyden, a second Hebrew chair was founded expressly for him 1619. Soon after this he was appointed Oriental interpreter to the govt., in which capacity he read and wrote replies to all official documents from the East. Such was the elegance and purity of his Arabic, that it is said to have excited the admiration of the emperor of Morocco. Toward the close of his life, tempting offers of honors and distinction came pouring in upon him from all parts of Europe; but he was never prevailed upon to leave his native country, where, in the midst of an eminent career, he died. Although the present standard of Oriental knowledge in Europe is much in advance of that of E.'s day, there is no doubt that the impetus of advance has been due principally to him. With hardly any better material than a few awkwardly printed Arabic alphabets, he contrived to write his famous grammar (*Grammatica Arabica, quinque libris methodice explicata*, Leyden 1613; recent ed. by Michaelis, Gött. 1771), which for 200 years, till the time of Silvestre de Sacy, kept undisputed supremacy; and there are many who think his *Rudimenta* unsurpassed, even to-day, as a work for beginners. Among his other important works the best known is his *Proverbiorum Arabicorum Centuriæ Duæ* Leyden 1614).

ERPETOLOGY, n. *ĕr′pĕ-tŏl′ŏ-jĭ* [Gr. *herpĕtŏn*, a creeping thing, a reptile; *logos*, discourse]: that branch of natural science which treats of the structure, habits, and history of reptiles; also spelled HERPETOLOGY.

ERR, v. *ĕr* [F. *errer*, to wander—from L. *errārĕ*, to wander: Ger. *irren*, to wander, to go astray: Fin. *eri*, separate, apart; *ero*, departure: Lap. *erit*, away, to another place: connected with Skr. root, *ar*, to plow]: to wander or stray

from the right way; to deviate from the line or path of duty; to miss the right way; to commit error. Er'ring, imp.: Adj. uncertain; wandering from the truth or the right way. Er'ringly, ad. *-lĭ.* Erred, pp. *ėrd.*

ERRAND, n. *ĕr'rănd* [AS. *ærend,* an errand: Icel. *eyrendi;* Sw. *ærende,* a message]: a message; something to be told or done by a messenger.

ERRANT, a. *ĕr'rănt* [OF. *errant*—from L. *erran'tem,* wandering—from *erro,* I wander]: wandering; rambling. Er'rantry, n. *-trĭ,* the employment of a knight who wandered about seeking adventures; a wandering. Knights-errant, knights wandering about in search of adventure.

ERRANTIA, n. *ĕr-răn'shĭ-a,* or Erran'tes, n. *-tēz* [the first form is the neut., the second the masc. and fem. plu. of L. *errans,* pp. of *erro,* I err, I wander: named in allusion to their good locomotive powers]: in *zool.,* errant annelids; the highest order of *Annelida.* They are called also *Chætopoda,* from the setigerous foot-tubercless which are their chief distinctive characteristics; *Nereides,* from their typical genus, *Nereis;* and, from the place which many of them inhabit, Sandworms. The head is well marked; the mouth has jaws which are sometimes at the extremity of a proboscis. The respiratory organs are in the form of external branchiæ arranged in tufts along the back and sides of the body, whence they are called Dorsibranchiate Annelids. They possess distinct sexes, and undergo a metamorphosis. They are marine, and occur in all seas. The order contains the families *Arenicolidæ, Aphroditidæ, Nereidæ, Eunicidæ, Peripatidæ,* and *Polyophthalmidæ:* in *paleon.,* the bodies of the Errant Annelids are as a rule so soft that the remains of them are not likely to be found, but what appear to be their horny jaws have been brought from the Silurian, the Devonian, and the Carboniferous formations. What may be their burrows, trails, and foot-impressions or prints have been found in the Silurian and some other Paleozoic rocks.

ERRATIC, a. *ėr-răt'ĭk* [L. *erratĭcus,* wandering to and fro—from *erro,* I wander: F. *erratique*]: having no fixed course; irregular; strange; queer; in *med.,* showing or having a tendency to spread; also Errat'ical, a. *-ĭ-kăl.* Errat'ically, ad. *-lĭ.* Erratics, n. plu. *ĕr-răt'ĭks,* or Erratic blocks, in *geol.,* those large water-worn blocks of stone, commonly called bowlders, scattered plentifully over the higher and middle latitudes of the n. hemisphere; so called because generally they have been derived from rocks at a distance. See Bowlders; Bowlder-clay.

ERRATUM, n. *ėr-rā'tŭm,* Erra'ta, n. plu. [L.]: error or mistake in writing or printing: the list of errors with their corrections sometimes placed at the end of a book. From greater carefulness in correcting the sheets of a a work in passing through the press, errors in sense or typography are now much more rare than formerly; in many instances, indeed, books (not of great size) are now

produced without a single error which needs to be pointed out and corrected.

On this subject interesting particulars are given in Disraeli's *Curiosities of Literature*, of which the following is a specimen: 'Besides the ordinary *errata* which happen in printing a work, others have been committed purposely, that the *errata* may contain what is not permitted to appear in the body of the work. Wherever the Inquisition had any power, particularly at Rome, it was not allowed to employ the word *fatum*, or *fata*, in any book. An author, desirous of using the latter word, adroitly invented this scheme: he had printed in his book *facta*, and in the *errata* he put, 'For *facta*, read fata.'

ERRHINE, a. *ĕr′rīn* [Gr. *errhīnŏn*, a medicine for inciting sneezing—from *en*, in, and *rhin*, the nose]: in *med.*, affecting the nose; producing discharge from the nose: N. a medicine administered locally to produce sneezing and discharge from the nostrils in catarrh, and in various disorders of the head and eyes. Common snuff, and various other vegetable irritants in powder are used.

ERRONEOUS, a. *ėr-rō′nē-ŭs* [mid. L. *errōnĕŭs*, wandering about—from *erro*, I wander]: not conformable to truth; wrong; false; mistaken. Erro′neously, ad. *-lĭ*. Erro′neousness, n. the state of being erroneous or false. Error, n. *ĕr′ėr* [F. *erreur*—from L. *errōrem*, a wandering, an error]: a deviation from the truth; a sin or transgression; involuntary wandering from the truth; a blunder; a mistake; in *law*, a writ so called, which carries the suit for redress to another court (see Error, Proceedings in). Er′rorist, n. *-ėr-ĭst*, one who encourages and propagates error.

ERROR, Proceedings in: form by which the unsuccessful party in an action at law brings his case for consideration before a court of review. (See Exchequer, Court of: Bill of Exceptions.) Error in law, signifies a mistake of judgment, either as to law or fact. Relief may be had against errors of fact in civil and criminal cases, but not against errors of law, since everyone is presumed to know the law. A mistake made in the trial or decision of a case, prejudicial to the party raising the question also is denominated error, and may constitute a ground for reversing the judgment. Error is also synonymous with writ of error. Writ of error, common law method of reviewing legal proceedings and decisions. It consisted originally in England of a commission issuing out of the court of chancery to judges, authorizing them to examine the record upon which a judgment claimed to be erroneous, had been rendered, and on the examination thereof, to affirm or reverse such judgment, as the law might require. The writ was grantable as a matter of right in all cases, except treason and felony. If the errors complained of were in matters of fact, the writ was styled *coram nobis* where the case was in the court of queen's bench, the sovereign being presumed to preside in that

tribunal; if in the other courts the writ was *coram vobis.* Writ of error is abolished in England, Appeal being substituted in its stead. In the United States the writ was usually issued out of the appellate court in which the review was sought. Some of the states have abolished writs of error, substituting direct appeals, in civil and criminal cases, while in some jurisdictions both writ of error and appeals are retained. See APPEAL, in Law.

ERRORS: mistakes, liable to occur in all observations. The best instruments have imperfections; and no man, however equable his temperament, can always rely on his making a proper use of his senses. In astronomy numerical correctness in the results of instrumental measurements is of the first consequence; therefore it is the constant care of the observer to detect and make allowance for errors. The three principal sources from which they may arise are (1) External or incidental causes, such as fluctuations of weather, which disturb the amount of refraction; changes of temperature, affecting the form and position of instruments, etc.; (2) *Errors of observation*, being such as arise from inexpertness, defective vision, slowness in seizing the exact instant of an occurrence, atmospheric indistinctness, etc.; and such errors as arise from slips in clamping and momentary derangements of the instrument; (3) Instrumental defects, owing to errors in workmanship, and such as arise from the instrument not being properly placed—called errors of adjustment. The first two classes of errors, so far as they cannot be reduced to known laws, vitiate the results of observations to their full extent; but being accidental, they necessarily sometimes diminish and sometimes increase in number and effect. Hence, by taking numerous observations under varied circumstances, and by taking the *mean* or *average* of the results obtained, these errors may be made to destroy one another to a great extent, and so far may be subdued. The method of subduing errors of the first two classes by the law of average is not applicable in all cases. In certain cases, recourse must be had to what is known as the method of least squares. See SQUARES, METHOD OF LEAST; also PROBABILITY. With regard to the third class, it is the peculiarity of astronomical observations to be the ultimate means of detection of all defects of workmanship and adjustment in instruments, which by their minuteness elude every other mode of detection. See Sir John Herschel's *Outlines of Astronomy*, § 138 *et seq.*

ERS, n. *ėrs* [L. *ervum*]: in *bot.*, *Ervum Ervilia*, the Bitter Vetch.

ERSBYITE, n. *ėrz'bĭ-īt* [Sw. *ersbyit*]: in *min.*, a doubtful mineral, called also anhydrous scolecite. It is nonoclinic, of a white color and vitreous lustre, and a hardness of six. Dana thinks that it may be altered orthoclase.

ERSCH, JOHANN SAMUEL: 1766, June 23—1828, Jan. 16; b. Grossglogau, in Lower Silesia: founder of German

bibliography. He had from an early period a bias toward that branch of literature in which he obtained so high a reputation. At Halle, where he was sent to study theology, 1785, he applied himself to historical investigations. After several vicissitudes he obtained, 1800, the office of librarian to the Univ. of Jena. Three years later, he was called to Halle as prof. of geography and statistics; and in 1808, was appointed in addition, principal librarian. He died at Halle. E. was long engaged in miscellaneous bibliographical work for other scholars; but in 1818, with Gruber, commenced the publication at Leipsic of the *Allgemeine Encyclopädie der Wissenschaften und Künste* (Universal Encyclopædia of the Sciences and Arts), a work of immense value. By his *Handbuch der Deutschen Literatur seit der Mitte des* 18 *Jahrh. bis auf die Neuste Zeit* (Handbook of German Literature from the Middle of the 18th Century to the most Recent Time, 4 vols. 1812–14), he first established modern German bibliography in the technical sense.

ERSE, n. *èrs* [contr. from *Irish*] name given by the Lowland people of Scotland to the branch of the Celtic language spoken by the inhabitants of the Western Highlands, as being of Irish origin: see BRETTS AND SCOTS. The proper name is Gaelic (q.v.).

ERSEK′-UJVAR′: see NEUHAUSEL.

ERSKINE, *èrs′kĭn*, EBENEZER: founder of the Secession Church in Scotland: 1680, June 22—1756, June 22; son of the Rev. Henry Erskine, minister of Chirnside, in Berwickshire, descendant of the noble family of Mar. He studied at Edinburgh, and after acting for some time as tutor and chaplain in the family of the Earl of Rothes, he was licensed to preach by the presbytery of Kirkcaldy 1702. In the following year he was appointed minister of Portmoak, in the shire of Kinross. Here he applied himself indefatigably to the study of the Scriptures, and to a serious and earnest preaching which became exceedingly attractive to the people accustomed to the chilling 'legalism' which then predominated in the Scottish pulpit. On 'sacramental occasions,' he had frequently attendants from the distance of 60 or 70 miles. In 1731, he was transferred to Stirling; his religious peculiarities had brought him into unpleasant relations with some of his brethern, through the interest which he exhibited in a book called the *Marrow of Modern Divinity,* marked by its strong evangelicalism of doctrine and sentiment. After his transference to Stirling, Erskine distinguished himself by his advocacy of popular rights in the settlement of ministers; and ultimately involved himself in such antagonism to the Church of Scotland, or at least to the ruling party in it of the time, that, with other three clergymen, he was deposed 1733: see UNITED PRESBYTERIAN CHURCH. He was shortly afterward joined by his brother Ralph and several other ministers. They now virtually formed a distinct sect, but continued to occupy

their parish churches. An effort was made, 1734, to restore them to their legal connection with the church; it was unsuccessful. In 1736, Erskine and his friends formally seceded, but it was not till 1740 that they were ejected from their churches. Shortly after this, a furious, and, as it now seems, a contemptible squabble broke out among the seceders in regard to the propriety of taking the burgess-oath. The result was a division of the sect into two bodies, the Burghers and Antiburghers. Erskine was the leader of the Burghers.

ERS'KINE, JOHN, of Carnock, afterward of Cardross; eminent Scottish jurist, and prof. of Scots law in the Univ. of Edinburgh: 1695—1768; son of the Hon. John Erskine of Carnock, third son of Lord Cardross, whose descendants have now succeeded to the earldom of Buchan. John Erskine, the father, having been forced to quit Scotland, from his attachment to the Presbyterian religion, retired to Holland, and became an officer in the service of the Prince of Orange. At the Revolution, he accompanied William to England, and, as a reward for the services, was appointed lieut.gov. of Stirling Castle, and lieut.col. of a regt. of foot. John Erskine, the younger, became a member of the Faculty of Advocates 1719, but did not succeed as a practitioner of the law. On the death of Alexander Bain, 1737, Erskine succeeded him in the chair of Scots Law, and filled that office 28 years. In 1754 he published his well-known *Principles of the Law of Scotland*, the text-book thenceforth used in legal study. On his retirement from the professorship in 1765, he prepared his more important work, *The Institutes of the Law of Scotland*, not published till five years after his death.

ERS'KINE, JOHN, D.D.: 1721, June 2—1803, Jan. 19; son of John Erskine of Carnock (author of *Institutes of the Law of Scotland*). He studied at the Univ. of Edinburgh, and was licensed to preach by the presbytery of Dunblane, 1743. In the following year, he was ordained minister of Kirkintilloch, where he remained until 1753, when he was presented to the parish of Culross, in the presbytery of Dunfermline. In 1758, he was transferred to New Greyfriars Church, Edinburgh; and in 1767, he was promoted to the collegiate charge of Old Greyfriars, where he had for his colleague Dr. Robertson. In the General Assembly of the Church of Scotland, he was for many years the honored leader of the popular or evangelical party. Between him and Principal Robertson, leader of the moderate party, there was an honorable friendship. Erskine's writings are exceedingly numerous. They consist of essays, letters, sermons, dissertations, etc.

ERS'KINE, RALPH: 1685, Mar. 18—1752, Nov. 6; b. Monilaws, Northumberland; brother of Ebenezer Erskine. He was ordained to the parish church of Dunfermline 1711. Sympathizing with the sentiments of his brother Ebenezer, he withdrew from the judicatures of the Established Church 1737. In the controversy concerning the burgess-oath he took part with his brother. His fame rests chiefly

on his *Gospel Sonnets* and other religious works, formerly very popular.

ERS'KINE, Thomas, Lord Erskine: 1750, Jan. 10—1823, Nov. 17; b. Edinburgh; youngest son of Henry David, tenth earl of Buchan, who though then reduced to an income of £200 a year, was of a race prolific in men of ability, and ennobled before the era of genuine history. After E. had attended for some time the High School of Edinburgh, the family removed to St. Andrews, at the grammar school of which place, and subsequently at the university, though probably not as a matriculated student, Thomas E. received such education as his parents could afford. They were educating his second brother, Henry, for the Scottish bar: (Henry, afterward the famous Harry Erskine, twice lord advocate of Scotland and a noted wit; 1746, Nov. 1—1817, Oct. 8: for the family history, see Col. Fergusson's *Henry Erskine: His Kinsfolk and Times*, 1882). The parents sent E. to sea as a midshipman. In this capacity he served for four years, until the death of his father, when he purchased a commission in the First Royals, and was for some time stationed at Minorca, where he employed his leisure in the study of English literature. On his return to London, his birth, his acquirements, the elegance of his manners, and volubility of his conversation, procured him a warm reception in the best circles. It was then that he had the controversy with Dr. Johnson on the respective merits of Fielding and Richardson, which Boswell has recorded; and that he published a pamphlet on the prevailing abuses in the army, which, though anonymous, was well known to be his, and obtained a great circulation. E. grew tired of the army as a profession, in which he saw little chance of promotion; and while in this humor, an accidental interview with Lord Mansfield at an assize court, determined him to study law. He was admitted a student of Lincoln's Inn, 1775, Apr. 26; and 1776, Jan. 13, he entered his name on the books of Trinity College, Cambridge, as a gentleman commoner. Many anecdotes are told of the privations which E. underwent when studying for the bar—how he lived on 'cow-heel and tripe,' dressed so shabbily as to be quite remarkable, and boasted that *out of his own family* he did not know a lord. Lord Campbell says, that 'during Easter and Trinity terms he excited a great sensation in the dining-hall by appearing in a student's black gown over the scarlet regimentals of the Royals; *probably not having a decent suit of plain clothes to put on.*' Though E. was aided by his aristocratic connection, his rise was very wonderful. Without the advantage of a business training, or what, probably even in those days, was far more important, a business connection, he rose into practice with almost unprecedented rapidity. After his first speech, the attorneys actually flocked round him with their retainers, and in telling the story, he used sometimes to bring the number which he received before quitting Westminster Hall up to sixty-five! His two first clients were officers in the navy—Captain Baillie, who held an office in Greenwich Hospital, against whom a rule had been obtained calling upon him to show

cause why a criminal information for a libel reflecting on Lord Sandwich's conduct as gov. of the charity, should not be filed upon him; and Admiral Keppel, who was tried by a court-martial at Portsmouth for incapacity and misconduct in an encounter with the French fleet off Ushant; and in both cases E. derived benefit from his own early connection with the service. Admiral Keppel sent him two £500 notes as a fee. From this time, E.'s good fortune as an advocate was uninterrupted. In 1783, he was returned to parliament for Portsmouth. Four years and a half after he was called to the bar, he had cleared £8,000 to £9,000, besides paying his debts, he had his silk gown, business of at least £3,000 a year, and a seat in parliament, and had made his brother lord advocate. In parliament, on the other hand, he failed so egregiously in his first speech as to leave his admirers scarcely any hope, and what is remarkable, his failure and Lord Eldon's took place the same night. To some extent the phenomenon was accounted for by Sheridan's remark when he said to him: 'Erskine, you are afraid of Pitt, and that is the flabby part of your character.' But notwithstanding his political mortifications, his professional career went on with increasing brilliancy. In 1786, he was made attorney-gen. to the Prince of Wales, by whom he was warmly patronized, but toward him and every one else he exhibited that manly independence which was the best part of his character. The fact of his appearing as counsel for Thomas Paine may be counted to his credit, while his removal in consequence from his office was declared by Lord Campbell a lasting disgrace to those from whom the measure proceeded. Throughout the political trials at that troubled period, he enacted the same manly part. When E. was proposed for the woolsack, an office far beyond his legal attainments, the king, George III., in consenting exclaimed: 'What! what! well! well!—but remember he is your chancellor, not mine.' Yet his decisions as lord-chancellor, according to Lord Campbell, are not so much *bad* as *superficial*, though by some equity practitioners they are spoken of as the *Apocrypha*. E. was engaged in the defense of Queen Caroline.

ERSMERT, n. *ėrs'mėrt:* the plant *Polygonum Hydropiper;* called also smart-weed.

ERST, ad. *ėrst:* see under ERE. ERST-WHILE, till then; till now; formerly.

ERSWORT, n. *ėrs'wėrt:* the herb mouse-ear (*Hieracium Pilosella*).

ERUBESCENT, a. *ĕr'ū-bĕs'ĕnt* [L. *erŭbĕscĕn'tem*, growing red—from *e*, out of; *rŭbĕr*, red]: reddish; flushing. ER'UBES'CENCE, n. *-ĕns*, redness of the skin or surface of anything. ER'UBES'CITE, n. *-bĕs'īt*, purple copper ore—a sulphide of copper and iron.

ERUCA, n. *ē-rō'ka* [L. a caterpillar]: insect in the larval state; a caterpillar.—E. is also a genus of plants of the ord. *Cruciferæ*, family *Brassicidæ* The seeds have a burning taste, and applied to the skin cause blisters. *Eruca s[illegible]ira.*

formerly called *Brassica eruca,* is used in the south of Europe, its native region, as a salad, the young and tender roots alone being chosen. The whole plant has been used as a sialologue.

ERUCARIDÆ, n. *ĕr-ô-kăr'ĭ-dē* [mod. L. *erucaria*]: a family of crucifers, tribe *Spirolobeæ,* of which Erucaria is the type.

ERUCIC ACID, *ĕr-ū'sĭk-* [L. *erūcă,* a species of cole-wort]: an organic body of the oleic acid series, obtained from oil of mustard and rape-seed.

ERUCTATE, v. *ĕ-rŭk'tāt* [L. *eructātŭs,* belched out—from *e,* out of; *ructātus,* belched: It. *eruttare:* F. *éructer*]: to throw up foul air from the stomach; to belch. ERUC'TATING, imp. ERUC'TATED, pp. ERUCTATION, n. *ē'rŭk-tā'shŭn* [F.—L.]: the act of belching wind or foul air from the stomach; the wind itself; a belch; a violent bursting forth of gaseous and liquid matter from any orifice or opening, as from the crater of a volcano or geyser.

ERUDITE, a. *ĕr'ū-dīt* [L. *erŭdītus,* free from rudeness, cultivated—from *e,* out of; *rŭdis,* rough: It. *erudito:* F. *érudit—lit.,* free from rudeness and ignorance]: instructed; conversant with books; learned. ER'UDI'TION, n. *-dĭsh'ŭn* [F.—.L]: knowledge gained by study of books; learning in literature; scholarship. ER'UDITELY, ad. *-dīt-lĭ.*—SYN. of 'erudition': learning; knowledge; science; literature: letters.

ERUGINOUS, a. *ē-rôj'ĭ-nŭs* [see ÆRUGINOUS]: resembling the rust of copper or brass.

ERUMPENT, a. *ĕ-rŭm'pĕnt* [L. *e,* out of; *rumpĕn'tem,* breaking]: in *bot.,* prominent, as if bursting through the epidermis, as in some tetraspores.

ERUPTED, a. *ĕ-rŭp'tĕd* [L. *ērŭptus,* broken out or burst forth—from *e,* out of; *ruptus,* rent asunder]: forcibly thrown out, as from a volcano. ERUP'TION, n. *-shŭn* [F.—L.]: a bursting out from confinement; a violent throwing out of anything, as flames or lava from a volcano; a sudden and overwhelming hostile rush of armed men from one country to another; a breaking out of pustules or pocks on the skin, as in measles, small-pox, etc. ERUP'TIVE, a. *-tĭv,* bursting forth; attended with eruptions or producing them; in *geol.,* applied to igneous rocks, which have evidently burst through the sedimentary strata.

ERVALENTA, n. *ėr-va-lĕn'ta* [L. *Ervum lens,* botanical name of the lentil]: farina or meal of the common lentil, prepared in a special manner. Its use as a food is said to promote the peristaltic action of the bowels.

ERVILIA, n. *ĕr-vĭl'ĭ-a* [L. *ervilia,* the bitter vetch]: in *zool.,* lentil-shell; a genus of bivalve mollusks, family *Tellinidæ.* Two recent species are known. Distribution: W. Indies, Britain, Canaries, Mediterranean, and the Red Sea.

ERVUM, n. *ėr'vŭm* [L., the bitter vetch, *Ervum Ervilia*]: in *bot.,* genus of papilionaceous plants, tribe *Viciæ Ervum lens* is the lentil. *Ervum Ervilia* is the bitter vetch. Its

seeds mixed with flour and made into bread produce weakness of the limbs, and render horses paralytic.

ERYCIBEÆ, n. *ĕr-ĭ-sĭb'ē-ē* [mod. L. *erycibe*]: in *bot.*, order of plants established by Endlicher for the reception of the genus *Erycibe*, by some others doubtfully ranked at the end of *Convolvulaceæ*. It is from tropical Asia.

ERYCINA, n. *ĕr-ĭ-sī'na* [*Erycina*, name of Venus—from Mount Eryx, now San Giuliano, mountain in Sicily, where she had a temple]: in *entom.*, genus of butterflies, typical of the family *Erycinidæ*. ERYCINIDÆ, n. *ĕr-ĭ-sĭn'ĭ-dē*, dryads; family of butterflies. The males have only four perfect legs, the females have six. In other respects they resemble the *Lycænidæ* (Argus Butterflies).

ERYINGO, n. *ĕr-ĭng'-gō* [L. *eryngion*, a species of thistle], (*Eryngium*): genus of plants of the nat. ord. *Umbelliferæ*, having simple umbels, which resemble the heads of composite flowers, a leafy involucre and leafy calyx, and obovate, sealy fruit destitute of both ridges and vittæ. The species are numerous, mostly natives of the warmer temperate parts of the world, with alternate, simple, or divided leaves, which have marginal spines. The SEA ERYINGO (sometimes ERYNGO), or SEA HOLLY (*E. maritimum*), is frequent on sandy sea-shores of Britain; a very stiff, rigid, and glaucous plant. *E. campestre* also has been found in England and Ireland, but is very rare. Its root was formerly much used in some parts of Europe as a tonic. That of *E. maritimum* is used in the same way, and possesses the same properties, being sweet and aromatic. It is sold in a candied state, and was formerly reputed stimulant, restor-

Sea Holly (*Eryngium maritimum*):
a, a floret; *b*, a petal; *c*, a stamen; *d*, the pistil.

ative, and aphrodisiac. Shakespeare makes Falstaff allude to the snowy color and supposed properties of this now

almost disused sweetmeat, for the preparation of which Colchester, England, has long been famous. E. root has been used also as an aperient and diuretic. Linnæus recommends the blanched shoots of *E. maritimum* as a substitute for asparagus. *E. fœtidum*, native of the warm parts of America, is called Fit-weed in the W. Indies, a decoction of it being much used as a remedy in hysterical cases. *E. aquaticum*, native of low wet places in N. and S. America, is called Rattlesnake Weed and Button Snakeroot. The root is diaphoretic and expectorant, and has a spurious reputation as a cure for the bite of the rattlesnake.

ERYSIMUM, *ē-rĭs'ĭ-mŭm:* genus of plants of the nat ord. *Cruciferæ*, tribe *Sisymbrieæ*. The pod is four-sided. *E. cheiranthoides*, a branching annual, about 18 inches high, with lanceolate scarcely toothed leaves and small yellow flowers, is found in many parts of Europe, also in N. America. It is common in waste places and cultivated grounds in Britain, but may perhaps have been originally intro-

Erysimum Cheiranthoides:

a, root; *b*, a branch, in which flowering has recently begun; *c*, the summit of a branch in a more advanced state, showing the fruit; *d*, the calyx; *e*, the parts of fructification, divested of floral envelopes; *f*, a flower.

duced for its medicinal use. Its seeds were formerly much used as an anthelmintic, from which it has the name of WORM-SEED. It is called also TREACLE MUSTARD, because it was an ingredient in the famous *Venice Treacle*. *E. perofoliatum* is cultivated in Japan for the fixed oil of its seeds. Some of the plants formerly referred to E. are now included in other genera, as *Sisymbrium* and *Alliaria* (q.v.).

ERYSIPELAS, n. *ĕr'ĭ-sĭp'ĕ-lăs* [L. *erysĭpĕlas*—from Gr. *erŭsĭp'ĕlas*, a red eruption on the skin—from *erŭthrŏs*, red; *pella*, skin]: an eruption of a fiery inflammatory nature on

some part of the body; the disease called St. Anthony's fire; the rose. ERYSIPELATOUS, a. *ĕr'ĭ-sĭ-pĕl'ă-tŭs*, eruptive; of or resembling erysipelas.—*Erysipelas* is an inflammatory disease of the skin, attended by diffused redness and swelling of the part affected, and in the end either by desquamation or by vesication of the cuticle or scarf-skin, in the milder forms, and by suppuration of the deeper parts in the severer varieties (phlegmonous erysipelas.) It is due to the presence and growth in the affected parts of a microorganism, a species of Streptococcus, but whether this is a specific germ, *Streptococcus erysipelatis*, or the ordinary germ of suppurative inflammation, *Streptococcus pyogenes*, which has become more than usually virulent, is not definitely determined. The germ gains admittance to the body through some break in the skin or mucous membrane—it may be a mere scratch or a pimple which has been accidentally, perhaps unconsciously, abraded.

Erysipelas affects, in a large proportion of instances, the face and head; it is apt to be attended with severe fever, and often with great disorder of the nervous system, arising in some instances from inflammation of the membranes of the brain. In other parts of the body, severe or phlegmonous erysipelas is apt to be succeeded by protracted and exhausting suppurations, and sometimes by diseases of the bones, or inflammations of the internal organs. Erysipelas is frequently an epidemic (q.v.) disease; it is also very apt to recur in a person who has been attacked once or oftener; and this is especially true of the form which affects the face.

The treatment is both local and general. The latter consists of a purge, usually calomel followed by a saline, and the administration of diuretic—pure water is the best. In the local treatment an attempt is sometimes made to limit the spread of the infection by deep criss-cross incisions surrounding the patch of inflammation. As this is painful, an anesthetic is usually required, and as it leaves scars it is inapplicable when the erysipelas is on the face. In the latter case, and in most cases, equally good results may be obtained by painting a ring around the *erysipelatous* area with several coats of tincture of iodine. The irritation of the inflamed surface may be relieved by soothing ointments of ichthyol, oxide of zinc, or boric acid. An antitoxic serum has been recommended, but its use is too recent to enable a correct decision as to its utility to be reached.

ERYSIPHE, n. *ĕr-ĭs'ĭ-fē* [Gr. *erusibē*, mildew]: in *bot.*, old genus of fungi now much reduced in extent by the removal from it of various species now ranked under distinct genera. When undeveloped they are called Oidia.

ERYTHACUS, n. *ē-rĭth'a-kŭs* [Gr. *eruthainō*, I dye red, I cause to blush, in allusion to the red plumage of the Robin Redbreast, a species of the genus]: typical genus of *Erythacinæ*, sub-family of warblers, of the e. hemisphere. The American robin, a thrush, was misnamed by colonists.

ERYTHEMA, n. *ĕr′ĭ-thē′mă* [Gr. *erŭthēmă*, redness—from *erŭthainō*, I make red]: in *med.*, a superficial and usually more or less circumscribed redness of the skin. Some forms of erythema are connected with constitutional diseases, as gout, rheumatism, and syphilis, and depend for their cure on the removal of the cause. ER′YTHEM′ATOUS, a. *-thĕm′ă-tŭs*, pertaining to. ER′YTHEMAT′IC, a. *-măt′ĭk*, a term applied to skin affections marked by or associated with redness, specially relating to erythema, erysipelas, and the more common rose-rash and nettle-rash. ER′YTHRINE, n. *-thrīn* [Gcr. *erŭthros*, red]: a mineral of a carmine and peach-blossom red color; arseniate of cobalt, or cobalt-bloom, used for the manufacture of smalt. ERYTHRIN, n. *ĕr′ĭ-thrĭn*, a very complex aromatic body found in certain lichens; also called ERYTHRIC ACID. ER′YTHRITE, n. *-thrīt*, a mineral, a flesh-colored variety of felspar; a tetravalant alcohol obtained as a solid white substance from certain lichens and fungi.

ERYTHRÆ′A: see CENTAURY.

ERYTHRÆAN SEA: in *anc. geog.* the Persian and Arabian gulfs, and a further undefined portion of the Indian Ocean. Later, the name denoted the Arabian Gulf.

ERYTHRIN: also called erythric acid, $C_{20}H_{22}O_{10}$, is contained in *Roccella fusciformis*, and crystallizes with $1\frac{1}{2}$ mols. of water which are not shown in the above formula. It is related chemically to the dyestuff cudbear. See DYES.

ERYTHRI′NA: see CORAL FLOWER.

ERYTHROCYTE: red blood corpuscle: see BLOOD.

ERYTHRODEXTRIN: see DEXTRIN.

ERYTHROMELALGIA: an affection of the feet characterized by attacks of redness, burning pain, and swelling in the soles; in some cases the condition is constant, in others it recurs in paroxysms at longer or shorter intervals. It is believed to be a neurosis affecting the vasomotor nerves of the feet, analogus possibly to Raynaud's disease or local congestion of the fingers.

ERYTHROLITMIN, n. *ĕ-rĭth-ro-lit′min:* in *chem.*, $C_{26}H_{23}O_{13}$: red coloring matter extracted by Kane from litmus.

ERYTHRONIUM, *ĕr-ĭ-thrō′nĭ-ŭm:* genus of bulbous rooted plants of the nat. ord. *Liliaceæ*, with drooping flowers and the segments of the perianth reflexed. *E. dencanis*, the DOG-TOOTH VIOLET, belongs to cent. Europe and s. Siberia; cultivated. The YELLOW ADDER'S TONGUE (*E. Americanum*) of the U. S. is a familiar yellow flower in May, with mottled lily-like leaves; bulbs emetic. The WHITE DOG-TOOTH VIOLET, leaves little or not spotted, has a yellow variety near Lake Superior.

ERYTHROPHLÆUM, *ē-rĭth-rō-flē′ŭm:* genus of trees of the nat. ord. *Leguminosæ*, sub-order *Mimoseæ*. *E. Guineense*, native of Guinea, is a very large tree, 100 ft. high, remarkable for the great quantity of red juice which every

part of it contains, and interesting on account of the employment of this juice by the natives for an ordeal to test the innocence or guilt of a person accused of crime. The juice is swallowed in large draughts, and those who remain uninjured by it are supposed to be innocent.

ERYTHROPHLEINE, n. *ĕ-rĭth-ro-flē′ĭn* [mod. L. *erythrophlæum*]: in *chem.*, poisonous base, extracted by alcohol from the bark of *Erythrophlæum guineense*, a tall leguminous tree, on the w. coast of Africa. It is only slightly soluble in ether, benzine, or chloroform, but is soluble in water and in alcohol. It forms salts with acids. In contact with manganese peroxide and sulphuric acid, erythrophleine develops a violet color less intense than that produced by strychnine; the color soon changes to a dirty brown. It acts as a poison by paralyzing the action of the heart.

ERYTHROPHYLL, n. *ĕ-rĭth′rō-fĭl* [Gr. *erŭthrŏs*, red; *phullon*, a leaf]: the red coloring matter of leaves, indicating change and low vitality in them.

ERYTHROTIDE, n. *ĕ-rĭth-ro-prō′tīd* [Gr. *eruthros*, red; *prōtos*, first]: in *chem.*, red extractive matter obtained by Mulder from albumen and allied substances.

ERYTHRORCHIS, n. *ĕ-rīth′ror-kĭs* [pref. *erythro;* Eng. *orchis*]: in *bot.*, genus of orchids, tribe *Arethuseæ*, family *Vanillidæ*. *Erythrorchis scandens* has slender stems a hundred ft. long, and runs like a creeper over trees in wet jungles in the Eastern peninsula and the adjacent islands.

ERYTHROSIS, n. *ĕ-rĭ-thrō′sĭs* [Gr. *eruthros*, red]: see PLETHORA.

ERYTHROSPERMEÆ, n. *ĕ-rĭth-ro-spėr′mē-ē* [mod. L. *erythrospermum*]: in *bot.*, tribe of *Flacourtiaceæ*. The styles are several, the fruit ultimately splits. ERYTHROSPER′MUM, n. *-mŭm* [Gr. *eruthros*, red; *sperma*, seed]: typical genus of the tribe *Erythrospermeæ*.

ERTYHROXYLACEÆ, *ĕr-ĭth-rŏks-ĭl-ā′sē-ē:* nat. ord. of exogenous plants, allied to *Malpighiaceæ*. They are trees or shrubs, with alternate simple leaves, stipules, flowers growing from amid scale-like bracts, calyx of five sepals, corolla of five petals, each petal having a curious appendage—a plaited scale—at the base, ten stamens united at the base, a 3-celled ovary with two cells empty, and the third containing a single ovule, three styles, and the fruit a drupe. Nearly 100 species are known, natives of warm countries, chiefly of tropical America. To this order belongs the COCA (q.v.). The wood of some of the species is bright red; that of *Erythroxylon* (Gr. red wood) *subcrosum* is used in Brazil for dyeing, and a permanent red is obtained from it. That of *E. hypericifolium* is the *Bois d'huile* (Oil-wood) of Mauritius.

ERYTHROZYME, n. *ĕ-rĭth′ro-zīm* [Gr. *erŭthros*, red; *zumē*, leaven]: in *chem.*, azotized substance, which exists in madder, and gives rise to a peculiar transformation of rubian. It is extracted by macerating madder in water at 38°, and precipitating the aqueous extract with alcohol.

ERYX, or ERIX, n. *ēr'ĭks* [L. *Eryx*, an opponent of Hercules, who slew him and buried him on a mountain, which retained his name. Various other classic men or myths]: in *zool.*, genus of snakes, family *Boidæ*. They are small in size, and have not the prehensile tail of the huge boas and pythons. They are found in India and the Eastern islands, and in Turkey, Greece, and Egypt.

ERZ'BERG: see EISENERZ.

ERZERUM, or ERZROUM, or ERZRUM, *ėrz-rôm':* province of Asiatic Turkey, in Armenia; bounded by Trebizond, Karpoot, Diarbekir, Van, Persia, and Transcaucasia; contains the sources of the Euphrates, Araxes, Koor, and Choruk rivers, and several chains of mountains, inhabited chiefly by Kurds; has a general elevation of 6,000 ft., and produces large quantities of fruits, rye, barley, flag, and grasses for sheep and cattle. Cap. and largest city in Armenia, Erzerum. Pop. of province 597,000; of capital (1900) 38,900.

ERZGEBIRGE, *ērts-ga-bēr'gēh* ('Ore Mountains'): chain of mountains, rich in metals, stretching s.w. on the confines of Saxony and Bohemia, from the valley of the Elbe to the Fichtelgebirge; long. 12° 20′ e. In the s. it rises 2,000 to 2,500 ft., forming a steep wall of rock; in the w., it forms broad, slaty plateaux, and gradually slopes down toward the Saxon side to the level districts of Altenburg and Leipzic. In consequence of this formation, the streams flowing southward are small, while the n. side of the chain, which is well wooded, presents a series of romantic, and occasionally fertile and thickly peopled valleys, watered by the Mulde, the Pleisse, and their numerous tributaries. The town of Gottesgabe, a site the highest in Germany, is toward the s. of the Erzgebirge range; long. 12° 54′ e., at an elevation of 3,162 ft. The Keilberg, highest point of the range, is 3,802 ft. above the sea. The Erzgebirge is chiefly of the gneiss-granite formation, in which most of the metal strata are to be found. Porphyry and basalt likewise appear.

ESARHADDON, *ē-sar-hăd'don*, King of Assyria: reigned B.C. 680–668; favorite son and successor of Sennacherib. He ascended the throne after two of his brothers had killed their father. He rebuilt Babylon and made it his southern capital; invaded Egypt, captured Memphis with all its treasures, and made the country as far as Thebes an Assyrian province; secured the n.e. frontier of his empire by an energetic campaign against the Minni and the Medes; penetrated to the heart of Arabia, and reduced a large number of native tribes to subjection; defeated the Cimmerians after checking their southward march, and drove them w. toward Sinope; subdued Cilicia, the Dahæ, and Eden; and was besieging Tyre when he died. He distinguished himself as an organizer and leader of armies; was mild and conciliatory in his civic administration; built or rebuilt vast palaces, fortresses, and temples, especially in Nineveh, Calah (Nimroud), and Babylon;

and was succeeded by his son Asurbanipal, or Sardanapalus, whom he had associated with himself in the govt. on his return from the Egyptian campaign.

ESAU, *ē′saw* ('hairy' or 'rough'): eldest son of the patriarch Isaac, and twin-brother of Jacob. As Esau grew up, he became 'a man of the field,' a cunning hunter, and his father's favorite. He seems to have been a wild, rough, hearty Bedouin, or son of the desert, thinking nothing of tomorrow, but living with joyous carelessness from day to day. This is apparent from the manner in which he allowed Jacob to defraud him of his birthright, though it carried with it, besides many temporal advantages, the Divine *Covenant-blessing* itself. After this transaction, Esau, when 40 years of age, married two Canaanitish women, 'which were a grief of mind unto Isaac and to Rebekah (Gen. xxvi. 35). Then follows the narrative of Jacob's personation of his brother, and his securing irrevocably the blessing to himself. Esau now swore to kill his brother, whereupon Rebekah sent Jacob to his uncle Laban in Padanaram. Esau next married his cousin Mahalath, daughter of Ishmael; and appears to have established himself in his wife's country, s. of Palestine in Mount Seir. Here he lived probably as a predatory chief. When Jacob was returning from Padanaram, Esau encountered him with 400 of his Bedouins. The meeting was a touching one. The wild borderer at least was in earnest. 'Esau ran to meet him, and embraced him, and fell on his neck, and kissed him' (Gen. xxxiii. 4). His anger had long died out. Esau next appears at the burial of his father Isaac, whom he seems to have loved with the warm and simple affection of a child of nature, and having obtained his share of the property, 'went into the country from the face of his brother Jacob' (Gen. xxxvi. 6). From Esau the region of Mount Seir took the name of Edom (q.v.), and his posterity are generally called Edomites.

ESCALADE, n. *ĕs′kă-lād′* [F. *escalade*—from It. *scalata;* Sp. *escalada*, an escalade—from L. *scālă*, a ladder: OF. *scalle*, a ladder]: the entering by troops into a fortified place by means of ladders: it consists in advancing over the glacis and covert-way; descending, if necessary, into the ditch by means of ladders; and ascending to the parapet of the curtain and bastions by the same ladders differently placed. A convenient form of ladders is in pieces of 12 ft. length, fitting end to end by means of sockets. A firing-party is usually told off, to keep down the fire of the enemy upon the escaladers, especially a flank fire lengthwise of the ditch, which might sweep them off with terrible rapidity. The leaders of an escalade constitute a 'forlorn hope.' ESCALADE, v. to enter a place by ladders. ES′CALA′DING, imp. ES′CALA′DED, pp.

ESCALATOR: the name applied to a continuous carrier designed for conveying passengers from one level to another within a limited time. The escalator consists

of an endless series of steps connected together by a heavy sprocket chain which, at the proper place, engages with the driving sprocket wheel. Each step is essentially a four-wheel truck, bolted to a shaft, which in turn, is connected to the links of the driving chain. There are two wheels at each end of the truck traveling on separate tracks, so placed that the steps remain horizontal at all points of the ascent. At the landing, at the top and the bottom of the escalator, the trucks travel in the same plane so that the steps there become a moving platform. Ample opportunity is thus given, even to the infirm, to board the device before the ascent begins and, at the top to step off again. A traveling hand-rail moving at the same speed as the steps further simplifies its use. Should a person fail for any reason to step off at the upper landing, a device called a shunt, removes him from it. This consists of a box-like affair, triangular in plan, placed about 10 feet from the top of the escalator with the apex pointing against the direction of the moving platform. In the lower part, set in a vertical position are two belts running backwards from the apex. Anything coming in contact with these belts is gently brushed to one side. The escalator is driven by an electric motor located within the structure of the upper landing and suitably geared to the large driving sprocket wheel by a combination of worm and spur gearing.

ESCALLONIA, n. *ĕs-kal-lō′nĭ-a* [named after *Escallon*, Spanish traveller in S. America, who first found these plants in Guiana]: in *bot.*, typical genus of the order *Escalloniaceæ*. The species are S. American trees or shrubs, with dotted leaves and white, pink, or red whorled leaves.

ESCALLOP, n. *ĕs-kăl′ŏp* [see SCALLOP]: a bivalve shell; inequality of margin.

ESCANABA: a city and cap. of Delta co., Mich., on the n. end of Green bay, at the mouth of the Escanaba river, and on the Chicago and Northwestern railroad; 360 m. n. of Chicago. It is the vegetable and grain-raising and lumbering center of the county and an important point for the shipping of iron ore, about 4,000,000 tons being exported annually. It also exports coal, lumber, and fish. It has passenger and freight steamer connections with the chief ports on the Great Lakes, public school, public library, daily and weekly newspapers, national bank, and an assessed property valuation of $2,000,000. Pop. (1910) 13,194.

ESCAPE, v. *ĕs-kāp′* [OF. *eschaper;* F. *échapper*, to shift away, to slip out of: It. *scappare*, to run away: Gael. *sgap*, to scatter, to escape: Icel. *skreppa*, to slip away]: to flee from and avoid; to get out of the way without injury; to shun or evade; to pass without notice; to avoid an evil, as punishment; to shun danger or injury: N. a getting away from danger; flight; excuse; evasion; subterfuge. ESCA′PING, imp.: N. avoidance of danger. ESCAPED′,

pp. *-kāpt.* Esca'per, n. one who. Escape'ment, n. that part of the machinery of a watch or clock by which the onward revolving motion produced by the moving power, whether weights or spring, is brought into contact with the regulating movement of the pendulum or balance-wheel: see Horology. Escapade, n. *ĕs'kă-pād'* [F.]: a mischievous freak; an impropriety of speech or slip of the tongue; the gambols of a horse. Escape warrant, warrant issued by a judge for the apprehension of persons who have escaped from prison.—Syn. of 'escape v.': to avoid, elude; eschew, flee.

ES'CAR: see Eskar.

ESCARP, v. *ĕs-kârp'* [F. *escarper,* to cut to a slope—from It. *scarpa,* the scarp or slope of a wall]: to form a slope: N. in *fortification,* the side or steep slope of the ditch next the rampart, and of the parapet itself. When the ditch of a fortress is dry, the escarp is usually faced with mason-work, to render it difficult of ascent; and behind this facing (*revêtement*) there are often passages or casemates for defense. In temporary fortifications, the *revêtement* is sometimes of wood; and in field-works, palisades at the foot, or fraises on the *berme* or edge of the ditch, are deemed sufficient. The escarp is always made at as large an angle as the nature of the soil will allow; the design being to offer the greatest possible obstacle to an assailant. Escarp'ing, imp. Escarped', pp. *-kârpt',* cut or formed to a sudden slope. Escarp'ment, n. *-mĕnt* [F.]: the steep face of a ridge of high land; ground about a fortified position cut away nearly perpendicularly to prevent the approach of an enemy.

ESCARTEL, v. *ĕs-kâr'tĕl* [F. *écarteler,* to quarter]: in *her.,* to cut or notch in a square form, or across.

ESCARTELEE, a. *ĕs-kâr'tĕl-lā* [F.]: cut or notched in a square from, or across.

ESCAUT': see Scheldt.

ESCHALOT, n. *ĕsh'ă-lŏt'* [F. *échalotte;* OF. *eschaloıe*—from mid. L. *ăscălōnĭă*]: an edible bulb related to the onion; the *shalot;* the *Allĭŭm ascalon'ĭcum,* ord. *Lilĭăcĕæ.*

ESCHAR, n. *ĕs'kâr* [Gr. *eschără,* a hearth, a scab: F. *esarre*]: in *med.,* a crust or scab, being a slough or portion of dead or disorganized tissue; usually produced artificially by application of caustics (q.v.). Es'charot'ic, a. *-kă-rŏt'ĭk,* having the power to sear or burn the flesh: N. a powerful caustic: see Caustic.

ESCHARIDÆ, n. *ĕs-chăr'ĭ-dē* [L. *eschara*]: in *zool.,* family of polyzoa or bryozoa, sub-order *Cyclostomata.* The cœnœcium is erect and rigid, with the cells arranged quincuncially in a single plane on one or both sides of the frond; in *paleon.,* range in time from the Oolitic period till now.

ESCHATOLOGY, n. *ĕs'kă-tŏl'ŏ-jĭ* [Gr. *eschătŏs,* extreme, last; *logos,* speech, discourse]: the doctrine of the four last or final things as regards man—viz., death, judgment,

heaven, hell; included in these, or introduced by them, are the Millennium, and the Future Coming of Christ; the state of man, through an extended period, immediately after death; the Resurrection through Christ; the Final Judgment as related to the End of the World; the ultimate delivering up of the kingdom of the Son of God to his Father. See HEAVEN; HELL; IMMORTALITY. ESCHATOLOGICAL, a. *ĕs'kă-tō-lŏj'i-kăl*, pertaining to the last or final things.

ESCHEAT, n. *ĕs-chēt'* [OF. *escheir*, to fall, to happen: *escheate*, the falling in of a property—from mid. L. *excadĕrĕ*, to fall upon, to meet—from L. *cădĕrĕ*, to fall]: lands or tenements which fall or revert to the lord or superior through failure of heirs, or by forfeiture; lands, etc., falling to the state through want of heirs, or forfeited by rebellion: V. to revert or fall to a superior, or to the state. ESCHEAT'ING, imp. ESCHEAT'ED, pp. ESCHEAT'ABLE, a. *-ă-bl*, liable to escheat. ESCHEAT'OR, n. *-ėr*, an officer who looks after escheats. ESCHEAT'AGE, n. *-āj*, the right to succeed to an escheat.—*Escheat* was an incident of the feudal law whereby, when a tenant in fee-simple died, leaving no heir capable of succeeding, the land reverted to his lord. According to the law of England, if the owner of an estate in fee-simple dies without leaving an heir, and without having disposed of his estate by deed or will, the land reverts to the overlord, who in the present day is almost invariably the sovereign, except in copyhold estates, which escheat to the lord of the manor. The species of escheat in English law, under attainder for treason or murder, is to be distinguished from forfeiture of lands to the crown for treason, which prevailed in other countries besides England: see FORFEITURE.

In the United States the original and ultimate proprietor of all lands is the state, and to it reverts the title of all lands which under the laws of England would go to the lord of the manor or to the crown. In most of the states E. is regulated by statute.

ESCHELLES, *ā-shĕll'*, LES: village in Savoy, formerly a Sardinian, now a French state, on the Guier, 12 m. s.w. of Chambéry. The valley beyond this village and on the road to Chambéry is blocked up by a huge limestone rock 800 ft. high, over which travellers formerly used to climb by means of ladders, and hence the name given to this village. Through this mass of limestone the public road now passes in a tunnel 25 ft. high, 25 ft. wide, 1,000 ft. long. The tunnel was projected and commenced by Napoleon I., and finished 1817 by the king of Sardinia.

ESCHENBACH, *ĕsh'ėn-bâch*, WOLFRAM VON: celebrated poet of the middle ages; b. in the second half of the 12th c., of a noble family, which derived its name from the village of Eschenbach near Ansbach; d. between 1219 and 25. He received the honor of knighthood at Henneberg, and passed his life in knightly fashion. In 1204, he came to the court of Hermann, landgraf of Thuringia, where he

shone among the poets of the time, at the so-called Wartburg-war (a rivalry of the German ministrels at Wartburg 1206 or 7). Eschenbach withdrew from the Thuringian court toward the close of his life. Eschenbach's poems are partly original, partly after French and Provençal models. His rich fancy, deep sentiment, and vivid power of representation, as well as his elegant mastery of language and versification, give something of an epic character to his works, the principal of which are *Parcival*, composed before 1212, *Wilhelm von Orange*, and *Titurel*. Besides these, we have several love-songs of his. Eschenbach exercised an important influence on his time, but subsequently was almost forgotten; and it is only recently that he has been restored to his place of honor. The first critical edition of his works was that by Lachmann (Berl. 1833). They were translated into modern German by San-Marte (2 vols. Magdeb. 1836–41), and with greater accuracy, though with too slavish literalness, by Simrock (2 vols. Stuttg. 1842).

ESCHER, *ĕsh'ėr*, Johann Heinrich, Alfred: 1819, Feb. 20—1882; b. Zurich: distinguished Swiss statesman. He studied at Bonn and Berlin. In 1842, he was created doctor of law at Zurich; and spent the two following years in Paris, devoting his attention chiefly to studies connected with Roman law. On his return to Zurich, Escher became a lecturer on Swiss political law, in the High School. In 1844, he was elected member of the great council of the canton, and was drawn into the arena of practical statesmanship. His sentiments were decidedly liberal. In 1845, Jan., with six others who shared his opinions, he published the famous summons to the popular assembly in Unterstrass for the expulsion of the Jesuits. His election into the council of the interior 1845, and into the council of education 1846, opened a wide field for his administrative talents in his native canton. The reorganization of the schools is chiefly his work. In 1847, Dec., he became pres. of the great council; and in his opening speech, recommended the complete reform of the confederacy, and the greatest possible centralization. In 1848, he was sent as deputy to the federal diet, and became pres. of the council of regency: in 1849 pres. of the national council. Latterly he was engaged in promotion of railway enterprise and banking institutions in Switzerland.

ESCHEW, v. *ĕs-chô'* [OF. *eschever*, to avoid: It. *schivare*, to avoid, to parry a blow: O.H.G. *sciuhan*, to frighten Sw. *skef;* Dan. *skieve*, oblique]: to avoid; to flee from; to shun. Eschew'ing, imp. Eschewed, pp. *ĕs-chôd'*.

ESCHSCHOLTZ, Johann Friedrich, *yō'hän frēd'rĭh ĕsh'shōlts*, Russian naturalist: b. Dorpat, government of Riga, 1793, Nov. 12; d. there 1834, May 19. He studied medicine in his native city, and in 1819 became professor of anatomy and director of the zoological museum of the University of Dorpat. In 1815–18 and 1823–6 he ac-

companied Otto von Kotzebue in the latter's exploring tours around the world, collected a large number of natural history specimens, and made valuable scientific studies on the lower organisms of deep-sea life. The results of his studies were published in Kotzebue's account of the expedition (1821), and he presented his collections to the University of Dorpat 1826. His catalogue of over 2,000 animals was published in Kotzebue's *Neue Reise um die Welt* (Vol. II. 1830). Adelbert von Chamisso, another member of these expeditions, named a botanical species *Eschscholtzia* in his honor, and Eschscholtz Bay, on the Alaska coast, is also named after him.

ESCHSCHOLTZ BAY, *ĕsh'olts:* portion of the Arctic Ocean in Alaska, the innermost part of Kotzebue Sound, first great inlet n. of Behring's Strait. It is about long. 161° w., being barely outside the polar circle. It has fossil remains, comparatively rare on that portion of the American continent, though common on the n. coast of Siberia.

ESCHSCHOLTZIA, n. *ĕsk-shŏlt'zĭ-ă:* genus of plants of the nat. ord. *Papaveraceæ,* of which are *E. Californica* and other species, natives of California, very showy with their large deep yellow flowers. The genus is remarkable for the calyx, which separates from the dilated apex of the flowerstalk, being thrown off by the expanding flower, and much resembling in its form the extinguisher of a candle.

ESCHWEGÉ, *ĕsh'vā-gėh:* a town of Prussia, in the province of Hesse-Nassau, is situated on the left bank of the Werra, 25 miles e.s.e. of Cassel. It consists of an old and new town, and a suburb; is surrounded with walls pierced by six gates; and is well built. The only building of note is the castle, which was long the residence of the landgrafs of Hessen-Rotenberg. Eschwegé has manufactures of woolen and linen fabrics, numerous tanneries, and several oil and other mills, also some trade in fruit and victuals. Pop. 10,000.

ESCHWEILER, *ĕsh'vī-lėr:* town of Rhenish Prussia, in the circle of Aachen, nine m. e.n.e. from the city of Aachen (Aix-la-Chapelle). It is a station on the railway between Aix-la-Chapelle and Cologne, at the confluence of the Inde and Dente. It has extensive manufactures of ribbons, woolens, canvas, needles, iron-wire, and machinery, also of wax-cloth, lace, glass, vitriol, and vinegar. In the vicinity are mines of zinc and lead. Pop. 18,119.

ESCLATTÉ, a. *ĕs'klăt'tā* [OF. pp. of *esclater,* to shiver]: in *her.*, term applied to anything shivered by a battle-ax.

ESCOBEDIA, n. *ĕs-ko bē'dĭ-a* [named after *Escobedo,* a Spanish botanist]: in *bot.*, typical genus of *Escobedieæ,* of the tribe *Scrophulariaceæ,* sub-order *Antirrhinideæ.*

ESCOBEDO, Mariano, *ĕs-kō-bā'dō,* Mexican soldier: b. Dos Arroyos, New Leon, 1827; Jan. 12; d. Tacubaya, 1902, May, 22. When the war between Mexico and the United States broke out he was a muleteer in charge of

a string of pack mules belonging to his father. He converted his muleteers into a band of guerrillas, attacked small detachments of the American troops wherever he found them, and took part in the battles of Palo Alto and Resaca. Juarez commissioned him colonel in 1859. In 1861, upon the establishment of Juarez' government in the City of Mexico, Escobedo was made a brigadier general and sent in pursuit of the Clerical forces under Marquez and Mejia, but was surprised, taken prisoner after an heroic defense, sentenced to be shot, but escaped and returned to Juarez. He took a prominent part in the engagements with the French which followed the intervention of Napoleon III. in Mexican affairs. He repulsed them at Puebla, 1862, May 5, took part in the long siege of that place, and when it was captured by the French, 1863, May 17, was taken prisoner, but succeeded in escaping. When Maximilian's empire was established, Escobedo took up his headquarters in Texas, secretly purchased arms and ammunition in New Orleans, 1865, organized and equipped a force of Mexican refugees, American negroes, and ex-Confederate soldiers, led them into Mexico, captured the imperial garrison at Monterey Nov. 1865, and swept everything before him. Juarez appointed him commander-in-chief of the Army of the North; he continued his victorious course until all the chief cities were in the hands of the republicans, and finally besieged and defeated the emperor at Queretaro, 1866, May 15. It is said that Maximilian offered his word of honor to Escobedo, on surrendering his sword, to leave the country at once if conducted to the nearest port; but Escobedo refused, ordered a court-martial to be instituted, and the emperor was condemned and executed. In 1874 he quelled an uprising against the government of Juarez, but was unsuccessful in putting down the revolution started by Gen. Diaz. He fled to Texas, issued a manifesto against Diaz, returned, was arrested and tried, and notwithstanding the government's efforts to convict him, was acquitted. To escape petty persecutions he went to New York 1879–80, but returned, and was appointed president of the supreme military court of justice 1882–3, when he retired at last to private life.

ESCORT, n. *ĕs'kŏrt* [F. *escorte*—from It. *scorta*, a convoy, a guide—said to be from L. *ex-corrigĕrĕ*, to set right: comp. L. *cohors*, a company of soldiers]: a body of armed men to attend or protect any person of distinction on a journey; a guard for the safety of baggage, etc. This word is sometimes used for naval protectors; but the proper word in this case is convoy. In the United States escorts are of two kinds, funeral escorts and escorts of honor. The army regulations fix the character and size of escorts according to the military prominence or title of the individual (see CONVOY); V. *ĕs-kŏrt'*, to attend as a guard on a journey; to accompany; to attend and guard

anything conveyed by land. Escort'ing, imp. Escort'ed, pp. guarded on a journey or excursion; attended.

ESCORIAL: see Escurial.

ESCOSURA, Patricio de la, *pâ-trē'thē-ō dā lâ ĕs-kō-sō'râ*, Spanish novelist and poet: b. Madrid, 1807, Nov. 5; d. there 1878, Jan. 22. After various political and military ups and downs and being twice exiled, in 1855 he was sent as a special envoy to the Portuguese court, became under-secretary of state, minister of the interior, and afterward ambassador to Germany, 1872–4. He wrote the historical novels: *The Count de Candespina* (1832); *Neither King nor Pawn* (1835); and *The Patriarch of the Valley*, the epics *The Bust in Black Cloak* and *Hernan Cortés at Cholula;* several dramas, the most successful of which was *Hernan Cortés' Debaucheries;* and several historical works, among them a *Constitutional History of England* (1859).

ESCOT, v. *ēs'kŏt* [OF. *escot*, payment of one's share of a common expense: Icel. *skot;* Scot. *scat*, a tax, money-payment]: in *OE.*, to pay a man's reckoning; to support; to pay. Escot'ting, imp. Escot'ted, pp. paid; supported; see Scot.

ESCOTT, Thomas Hay Sweet, English journalist: educated at Queen's College, Oxford, and since 1865 actively connected with London journalism. He has been a leading article writer for the *Standard* since 1866 and succeeded John Morley (q.v.) as editor of the *Fortnightly Review.* He has published: *England: Its People, Polity and Pursuits* (1897); and its sequel, *Social Transformations of the Victorian Age* (1897); *Politics and Letters* (1880); *Lord Randolph Churchill: a Monograph* (1895); *Personal Forces of the Period* (1898); *A Trip to Paradoxia* (1899), etc. He has also published an edition of *Juvenal and Persius.*

ESCRITOIRE, n. *ĕs'krĭ-twawr'* [OF. *escritoire*, an inkstand—from mid. L. *scriptōrĭŭm*, a writing-room or study]: a box or case with a desk and materials for writing; a writing-table or cabinet.

ESCROD, n. *ĕs-krŏd':* a small cod broiled; a scrod.

ESCROL, n. *ĕs'krōl':* in *her.*, a scroll; a slip of paper, parchment, etc., on which the motto is written.

ESCUAGE, n. *ĕs'kū-āj* [OF. *escusson*, diminutive of *escu*, a shield—from It. *scudo;* L. *scutum*, a shield]: *literally*, service of the shield; a commutation for the personal service of military tenants in war. Escutch'eon, n. *-kŭch'ŭn*, the shield on which a coat of arms is represented; a hatchment; picture of the ensigns armorial. Escutch'eoned, a. *-ŭnd*, having an escutcheon or hatchment. *Note.*—The two sides of the front of a shield or escutcheon are named respectively the *dexter*, that is, the *right*, and the *sinister*, that is, the *left*, with reference to the right and left hand of the bearer. To the eye of the spectator they are of course exactly reversed.

ESCUDO, n. *ĕs-kō'dō:* in *numis.*, Spanish coin containing ten reales. Ten escudos are equal to one pound sterling.

ESCUDO DE VERAGUA, *ĕs-kō'do dā vā-râ'gwâ:* river on the Atlantic side of Central America—having at its mouth an island of the same name. The river and island are a little e. of the boundary between New Granada and Costa Rica; the island in lat. 9° n., and long. 81° 30′ w. The river, only 15 m. long, is noticeable only from the narrowness of the belt which here separates the Atlantic and Pacific.

ESCULAPIAN, a. *ĕs'kū-lā'pĭ-ăn* [*Æscŭlāpĭŭs;* Gr. *Asklēpĭŏs,* the god of the healing art in anc. mythology]: pertaining to the healing art; medical; also spelled ÆSCULAPIAN: see ÆSCULAPIUS.

ESCULENT, a. *ĕs'kū lĕnt* [L. *escŭlĕntus,* fit for eating-edible—from *esca,* food]: good for food; eatable: N. some, thing that is eatable.

ESCURIAL, *ĕs-kō-rē-ăl'* (correct title, EL REAL SITIO DE SAN LORENZO EL REAL DE ESCORIAL): famous monastery of New Castile, province of Madrid, 30 m. n.w. of the town of Madrid. This solitary pile of granite has been called the eighth wonder of the world, and at the time of its erection surpassed every building of the kind in size and magnificence. It owes its origin (at least so it is said) to an inspired vow made by Philip II. during the battle of St. Quentin. On that occasion, he implored the aid of St. Lorenzo, on whose day, 1557, Aug. 10, the battle was fought; and vowed that, should victory be granted him, he would dedicate a monastery to the saint. The E. is built in the form of a gridiron, in allusion to the instrument of St. Lorenzo's martyrdom, and forms a huge rectangular parallelogram 744 ft. from n. to s., and 580 ft. from e. to w., and divided into long courts, which indicate the interstices of the bars. Towers at each angle of this parallelogram represent the feet of the gridiron, which is supposed to be lying upside down; and from the centre of one of the sides, a range of building abuts, forming the royal residence, and representing the handle. The E., begun 1563, finished 1584, was intended to serve as a palace, mausoleum, and monastery. It has a splendid chapel with three naves, 320 ft. long, and 320 in height to the top of the cupola. The *Pantheon,* or royal tomb, is a magnificently decorated octagon chamber, 36 ft. in diameter by 38 ft. high, in the eight sides of which are numerous black marble sarcophagi. Kings only and the mothers of kings are buried here. The E. is an immense building; it is stated that it has 14,000 doors and 11,000 windows, and its cost was 6,000,000 ducats. Its library, previous to the sack of the E. by the French 1808, contained 30,000 printed and 4,300 MS. vols. mainly treasures of Arabic literature, of which a catalogue, but not a good one, was drawn up by Casiri in his *Bibliotheca Arabico-Hispanica* (2 vols. Madrid 1760–70). They were, however, at that time, removed to Madrid; and on being sent back to the E., it was discovered that the library con-

sisted of only about 20,000 vols.—a third having been lost. The French also plundered the place of its valuable collection of coins, medals, and pictures. In 1872, Oct. 2, the E. was struck by lightning, and partially burned. The E. is saved from falling into ruin by occasional grants of public money.

ESCUTCHEON, see under Escuage: in *heraldry*, synonymous with shield (q.v.).

ESCUTCH'EON OF PRETENSE, or Inescutch'eon, in Heraldry: a small shield placed in the centre of the larger one, and covering a portion of the charges on the latter, in which a man carries the arms of his wife when she is the heiress of her family. It is said to be carried *surtout*, or over-all. Sometimes also a shield over-all is given as an honor.

ESDRAËLON, *ĕs-dra-ē'lon* [Greek form of the Hebrew Jezreel]: large and celebrated plain in central Palestine. It is triangular in shape with its apex toward the south near Jenin. From this point its eastern side, extending north about 15 m. and forming the watershed of the region, strikes the hills of Galilee two m. s.e. of Nazareth. Its n. side, inclining toward the s.w., is 12 m. long; and its s.w. skirting the hills of Samaria for more than 18 m., comes back to Jenin. From this main body three branches go out toward the e., the middle one of which is the valley of Jezreel, so famous in the history of Israel. The whole extent of the plain, naturally very fertile, is now a desolation. From the days of Barak and Sisera to those of Napoleon, it has been, because of its extent and central position, conspicuous as a thoroughfare for great armies, and as a fiercely contested battle-field; and for this reason it is, under one of its names—Megiddo—used in the book of Revelation as an emblem of the ground on which the final contest will be decided between the powers of light and darkness.

ESDRAS, *ĕs'dras* or *ĕz'dras*, Books of: portion of the Old Testament Apocrypha (q.v.). (The word *Esdras* is the Greek form of Ezra, and indicates that the books so named do not exist in Hebrew or Chaldee). In the Vulgate, the first book of Esdras means the canonical book of Ezra; and the second, the canonical book of Nehemiah; while the third and fourth are what we call the first and second books of Esdras. But in the Vatican and other editions of the LXX., what we call the first book of Esdras comes first, and is followed by the canonical book of Ezra, termed the *second* book of Esdras. In all the earlier editions of the English Bible, the order of the Vulgate is followed. The Geneva Bible was the first to adopt the classification now used, according to which Ezra and Nehemiah give their names to two canonical books, and the two apocryphal become first and second Esdras. As regards the *first* book of Esdras, it is for the most part a transcript—not very accurate—of Ezra and a portion of Nehemiah, together with the two last chapters of II. Chronicles. It is impossible to ascertain anything regarding its age or authorship. Josephus quotes it extensively in his Antiquities.

even when it contradicts *Ezra* proper, a fact which indicates that it was highly valued by the Jews. The hackneyed phrase, *Magna est veritas et prevalebit* (Truth is great, and will prevail), is taken from chap. iv., v. 41, of this book. The *second* book of Esdras, or Revelation of Esdras, is wholly different in character from the first, and it has even been doubted whether it is the work of a Jewish, or of a semi-Christian writer. Lawrence and Hilgenfeld argue for its being composed B.C. 28–25; Lücke, shortly after the death of Cæsar (B.C. 44); while Gfrörer, Bauer, and Wieseler assign it to a period as late as the reign of Domitian (A.D. 81–96). The opinion which has the weightiest evidence is, that the book was originally the composition of a Jew, but that it has been largely interpolated by Christian writers. The book was written probably in Egypt, and forms part of what has been called the 'Apocalyptic Cycle' of Jewish literature (see REVELATION OF ST. JOHN). It consists of a series of angelic visions and revelations made to Ezra, regarding the mysteries of the moral world, and the final triumph of the righteous, who, however, are to be but 'a very few.' The descriptions are occasionally very striking, and even sublime, and if the doctrinal portions contain the original views of a man living before the apostolic era, the source of the Pauline phraseology can in part be discovered.

ESEMPLAS'TIC, a. [Gr. *es,* into; *hen,* one; *plastikos,* molding, shaping]: molding; shaping; fashioning into one.

ESENBECKIA, *ĕs-ĕn-bĕk'ĭ-a:* genus of trees of the nat. ord. *Diosmaceæ.* The bark of *E. febrifuga,* a tree 40 ft. high, native of the s. of Brazil, is said to be equal in its effects to Peruvian bark.

ESERINE, n. *ĕs'ĕr-ĭn* [*eséré,* native name for the Calabar bean]: in *chem.,* physostigmin, $C_{15}H_{21}N_3O_2$; base contained in the Calabar bean. It is a yellow amorphous mass, very poisonous, causing contraction of the pupil of the eye.

ESK, *ĕsk* (Gaelic, *uisg,* water): name of several small Scotch rivers. The Dumfriesshire Esk is formed by the confluence of the Black and White Esk, which rise near the centre of the Southern Highlands. The united stream runs 35 m. s., and forms for a mile the boundary between Scotland and England, and finally falls into the head of the Solway Firth The upper part of the valley of this E., which is wild and pastoral, is called Eskdale Muir.—The Edinburghshire N. and S. Esk rise in the n. of Peeblesshire, between the Pentland and Moorfoot Hills, and both run n.n.e. through a beautiful tract in the east of Edinburghshire. The two branches unite in Dalkeith Park, and run into the Firth of Forth at Musselburg.—The Forfarshire N. and S. Esk rise in the Grampians; the N. flows 25 m. s.e. into the sea, 4 m. n. of Montrose. The S. Esk flows 40 m. s.e. and e., crossing the valley of Strathmore, passing Brechin, and ending in the tidal lagoon of Mont-

ESKAR, *ĕs'kar*, or Eskir, or Escar: term applied in Ireland to certain objects in the superficial drift, in several parts of that country; known also in Scotland as *kaims*, but more abundant in Sweden than in any other known country, being there recognized as *ösar*. An *eskar* is generally a long linear ridge of rounded gravel, chiefly of carboniferous limestone, including pieces of considerable size; in Sweden, they often have rough erratic blocks deposited upon them: they are sometimes heaped in narrow ridges 40 to 80 ft. high, and 1 to 20 m. long. It is an unsettled point whether they are connected with glacial action; if connected with it, the whole appearances and consistency demonstrate at least subsequent marine action. There is a remarkable eskar on a moor spreading below Dirrington Law, in Berwickshire, Scotland (900 ft. above the sea); another, about a mile long, has been pointed out amid a vast alluvial accumulation at St. Fort, Fifeshire. See Moraine: Glacier.

ESKI-DJUMNA, *ĕs'kē-jôm'nâ:* town of the principality of Bulgaria, 20 m. w. of Shumla. Estimated Pop. 10,000.

ESKIMO, n. *ĕs'kĭ-mō:* another spelling of Esquimaux, which see.

ESKI-SAGRA, *ĕs'kē-sâ-grâ:* town of European Turkey, province of E. Roumelia, at the s base of the Balkan Mountains, 70 m n.w. of Adrianople. In the vicinity are numerous gardens and orchards, also several mineral springs in great repute. The manufactures are carpets, coarse linens, and leather. Pop. 15,000 to 20,000.

ESLA, *es'lâ:* river of Spain: important affluent to the Douro, rising in the province of Palencia, Old Castile, from the s. base of the Asturias Mountians, 10 m. n.w. of the town of Valleburon. Through its whole course, it flows s.w., and joins the Douro 15 m. below the town of Zamora; length 125 m. Its waters, which are joined by numerous streams, are well stocked with fish.

ESMARCH, *es'mârch*, Johannes Friedrich August: distinguished German surgeon; b. Tönning, Schleswig-Holstein, 1823, Jan. 9. He received his medical and surgical education in the Universities of Kiel and Göttingen, was attached to the Kiel hospital 1846, served through the Schleswig-Holstein war as army surgeon, and was taken prisoner with the greater part of the army 1848, Apr. 6. After being exchanged, he was appointed surgeon to the hospital of Flensbourg, and in the following campaigns was aid to Surgeon de Stromeyer. In 1857, he succeeded Stromeyer as director of clinical surgery, and 1860 was appointed prof. and director of the Kiel hospital. In 1870 he was a member of the hospital commission of the Prussian army, and while his health would not permit him to accompany the army into France, he organized the general ambulance service, and the special hospitals at Kiel, Hamburg, and elsewhere. He also introduced a system of bloodless operations. After the war he returned to his duties at Kiel Univ. His first wife was daughter of Prof. Stromeyer, and his second the Princess Henrietta of

Schleswig-Holstein. In the autumn of 1888 he made a trip to the United States and performed a remarkable surgical operation in New York in the presence of some of the most distinguished surgeons in the country. He is author of numerous medical, surgical, and sanitary publications.

ESMERALDAS, *ĕs-mā-râl'dâs* (Sp. for *Emerald*): province in the n.w. part of the state of Ecuador (q.v.), S. America; watered by the E. river. It is mostly covered with forests, but produces excellent cacao and tobacco. Pop. (1885) 11,146.

ESMERALDAS River: rising near the city of Quito, in Ecuador, S. America; entering the Pacific after a course of 110 m.; lat. 1° 5′ n., and long. 79° 40′ w.—Ten m. from its mouth is the town of Esmeraldas; pop. abt. 4,000.

ESNÉ, *ĕs'nā*, or Esna, *ĕs'na*, or Esneh, *ĕs'nĕ*, the hieroglyphic *Sen*, and the Greek *Latopolis* or *Lattônpolis* (the city of the Latus fish or *Latus nobilis*, from the fish there worshipped): thriving but badly built town of Upper Egypt, on the left bank of the Nile, lat. 25° 15′ n. It has some manufactories of fine cotton, shawls, and pottery. It is an entrepôt for the Sennaar caravans. There are famous ruins at E., of a sandstone temple, with a portico of four rows of six columns, which appears to have been founded by Thothmes III., whose name is seen on the jambs of a door. The temple, however, seems to have been restored or principally constructed by Ptolemy Euergetes (B.C. 246–222), and the pronaos was erected in the reign of Emperor Claudius A.D. 41–54), and completed in that of Vespasian. The interior is of the date of Trajan, the Antonines, and Geta, whose name, erased or replaced by that of Caracalla, is there found. The great temple was dedicated to Chnumis, Satis, and Har-Hek. It has a zodiac like that of Denderah, formerly thought to be of the most remote antiquity, but now known to be no older than the Romans. A smaller temple with a zodiac, erected in the reign of Ptolemy Euergetes, formerly stood at E'Deyr, 2½ m. n. of E., but it has been destroyed. At E. is also a stone quay, bearing the names of M. Aurelius. This city was the cap. of a nome, and the coins struck in it in the reign of Hadrian, A.D. 127–128, represent the fish latus.—Champollion, *Not. Descr.* p. 283; Wilkinson, *Mod. Egypt*, II., p. 268; Tochon d'Annecy, *Médailles.*—Pop. abt. 12,000, of which many are Copts.

ESNECY, n. *ĕs'nĕ-sĭ* [F. *aînesse*, priority of birth]: in *law*, right, under some laws, of the eldest coparcener in the case where an estate descends to daughters jointly for want of an heir male, of making the first choice in the division of the inheritance.

ESO, pref. *ĕs-ō* [Gr. *esō*, *eisō*, to, within, into]: within.

ESOCIDÆ, n. plu. *ē-sŏs'ĭ-dē* [L. *esŏx*, or *esŏcem;* Gr. *isox*, a species of pike]: family of malacopterous fishes; now regarded as including only the pikes (q.v.), but in which the flying fishes (*Exocœtus*) and other fishes, now constituting the family *Scomberesocidæ* (q.v.), and of the order *Pharyngognaths*, were until recently included.

ESODIC, a. *ĕs-ŏd′ĭk* [Gr. *eis*, into; *hodos*, a way]: in *phys.*, conducting influence to the spinal marrow. (Used of the nerves which have this function.)

ESOENTERITIS, n. *ĕs-ō-ĕn-tĕr-ī′tĭs* [pref. *eso-*; Eng. *enteritis*]: in *pathol.*, inflammation of the mucous membrane of the intestines.

ESOGASTRITIS, n. *ĕs-ō-găs-trī′tĭs* [pref. *eso-*, Eng. *gastritis*]: in *path.*, inflammation of the mucous membrane of the stomach.

ESOPHAGUS, n. *ē-sŏf′ă-gŭs:* the passage through which food and drink pass to the stomach; the gullet. Spelled also ŒSOPHAGUS (q. v.).

ESOPIAN, a. *ē-sō′pĭ-ăn* [from *Æsop*, an anc. Greek who wrote fables]: composed by Æsop; after the manner of Æsop (q.v.).

ESOPUS, *ē-sō′pŭs:* original name of the settlement at or near what is now the city of Kingston (q.v.), N. Y.—ESOPUS WAR, a series of conflicts at E. between the Dutch settlers and the Indians, 1658–64; ending in the burning of the village of Wietwyck, the killing of 21 settlers, and the captivity of 40 women and children.

ESOTERIC, a. *ĕs′ō-tĕr′ĭk* [Gr. *esōtĕrĭkŏs*, belonging to what is interior or abstruse—from *ĕsō*, within]: term derived from the anc. mysticism, denoting private; secret; pertaining to doctrines taught in private only to the initiated; opposed to *exoteric*, denoting the form of such doctrines taught to the public. ES′OTER′ICAL, a. *-ĭ-kăl.* ES′OTER′ICALLY, ad. *-lĭ.* ES′OTER′ICS, n. plu. *-ĭks*, mysterious or hidden doctrine.

ESPADON, n. *ĕs′pă-dŏn* [It. *spadone*, a two-handed sword—from *spada*, a sword]: a long heavy sword wielded by a powerful foot-soldier, or used in decapitating by an executioner.

ESPALIER, n. *ĕs-păl′yĕr* [F. *espalier*, railing on which fruit-trees are trained as though against; or actually against a wall—from It. *spalliéra*, the back of a chair, an espalier: Sp. *espaldera*, wall-trees—from *espalda*, a shoulder]: railing or trellis on which fruit-trees are trained in a row. By allowing the air and sunlight to pass freely among the leaves this system promotes early ripening of the fruit, prevents injury to the branches and loss of immature fruit from winds, and requires but little land. It is nearly equal to wall training for which it is an excellent substitute. The apple, pear, peach, and nectarine, are most frequently grown in this manner. A common method is to nail slats or wires to a line of posts and close to these set a row of very small trees. Shoots which are form to the arms of the trees are tied to the trellis in the desired position. Fruit is produced on the short laterals which are allowed to grow from these arms. In the case of trees which produce fruit on new wood, a succession of laterals is secured by skilful pruning, the old ones being removed after fruiting. The arms are trained in a horizontal position, in the style of a fan, or of a wine glass, and in various other artificial forms.

In the oblique rod system the stem is trained at an angle of about 45 degrees, while the oblique double rod method allows two branches, which are bent in a similar manner. The flow of sap is thus retarded, productiveness is increased, and the quality of the fruit improved. In the cordon, or hedge-row method, the trees are set only 16 inches apart, trained to a trellis, and very closely pruned. An inclined trellis is frequently used where special protection from cold is desired. The espalier, common in Europe, has been used in this country only in growing very tender varieties and for ornamental purposes. See FRUIT: FRUIT-GARDEN: ORCHARD-HOUSE.

ESPARTERO, *ĕs-par-tā'rō*, JOAQUIN BALDOMERO: Ex-regent of Spain, Count of Luchana, Duke of Vittoria, etc.: 1792-1879, Jan.; b. Granatula, in La Mancha (Ciudad Real), where his father, Antonio E., was a cartwright. E. was intended for the ecclesiastical profession, and in 1806 went to the Univ. of Almagro, but two years later, on the invasion of Spain by the French, he entered the Sacred Battalion (*Batallon Sagrado*), composed almost entirely of students. After the close of the War of Independence 1814, he went to S. America, where he fought against the insurgents; but after the victory by Bolivar at Ayacucho, 1824, Dec. 9, had put an end to the Spanish rule on the continent of America, E. returned to Spain. In 1832, he declared himself openly in favor of the succession of the daughter of Ferdinand VII.; and on the breaking out of the civil war after the king's death, he soon rose to the rank of lieut.gen. In 1836, Aug., he succeeded in saving the city of Madrid, and became successively gen.-in-chief of the army in the north, viceroy of Navarre, and capt.gen. of the Basque provinces. When the army of Don Carlos appeared before Madrid, 1837, Sep. 12. E. had again the glory of saving the capital. His successful campaign, 1839, which resulted in the expulsion of Don Carlos from Spain, procured him the title of Grandee of Spain, and Duque de la Vittoria y de Morella. In 1840, the queen-mother Christina was compelled to resign her office of regent, and 1841, May 8, E. was appointed by the cortes to supply her place until the queen (Isabella) should have reached her majority. E. guided the helm of the state with energy, firmness, and ability; but in 1843, an unscrupulous and unprincipled combination of parties naturally inimical to each other, the republicans and the moderados, brought about his fall, and E. sailed for England, where he resided four years. In 1847, he returned to Spain, and lived quietly at Logroño till 1854, when the wretched despotism and profligacy with which the name of Christina is associated, caused an insurrection of the people, and compelled the queen-mother to leave the kingdom. E. was again called to the head of the govt., and conducted the affairs of the nation for two years; but 1856, July, he was supplanted by General O'Donnell. In 1857 he resigned his dignity as senator, and after that time rarely took part in politics. After the revolution 1868, which resulted in the expulsion of Queen Isabella, E. gave his full and hearty adhesion to the

provisional government, though he took no part in their proceedings. In 1870, E. was induced to become a candidate for the throne of Spain; but withdrew in June of the same year, alleging his age and the division of parties as excuse. In 1875 he adhered to King Alfonso.

ESPARTO, n. *ĕs-pâr′tō* [Sp. *esparto*—from L. *spartum;* Gr. *sparton,* Spanish broom]: (*Stipa* or *Macrochloa tenacissima*): species of grass nearly allied to the well-known and beautiful feather-grass (q.v.), native of the s. of Europe (especially Spain) and n. Africa. It is used by the Spaniards for making sandals, nets, sacks, etc.; and has become an important material in paper-making. It can grow without cultivation, is easily harvested and yields, with very simple treatment, a large percentage of cellulose of high quality. The esparto is freed from dirt mechanically and heated in large iron boilers, under pressure, with sodium hydroxide solution. The residue is washed with water, bleached and then converted into paper (q.v.).

ESPATHATE, a. *ē-spā′thāt* [L. *e,* out; *spatha,* the spathe of a palm-tree]: in *bot.,* not having a spathe.

ESPECIAL, a. *ĕs-pĕsh′ăl* [OF. *especial*—from L. *speciālis* not general—from *speciēs,* a kind: It. *speciale:* F. *spécial*]: chief; principal; particular. ESPE′CIALLY, ad. *-lĭ,* principally; particularly; in an uncommon degree above any other. ESPE′CIALNESS, n.

ESPERANTO, n. *ĕs′pĕr-ăn′tō* ["The Hopeful"—from L. *spērārĕ,* to hope]: a universal language, the invention of Dr. Zamenhoff. It contains only those sounds common to and words or roots current in all languages, easily convertible from one part of speech to another. Esperanto has had considerable vogue since the beginning of the 20th century. See J. C. O'Connor's *Esperanto: the student's complete text-book* (1903).

ESPINASSE *ĕs-pē′nâs′,* JULIE JEANNE ELEONORE DE L': one of the most fascinating women of her time: 1732, Nov. 19–1776, May 23; b. Lyon, France; illegitimate daughter of a Mme. d'Albion. After the death of her mother, Mlle. de l'Espinasse, who had received an excellent education, went, as *gouvernante,* to the house of her brother-in-law, the Marquis de Vichy-Chamroud. In 1752, she went to Paris as *demoiselle de compagnie* to the Marquise Du Deffand (q.v.). The two ladies lived together agreeably; until a rupture resulted from the admiration which the young and beautiful *demoiselle* attracted from the circle in which Du Deffand had formerly been the chief attraction. Even D'Alembert, the famous encyclopédist, hitherto the most constant admirer of Du Deffand, gave his devotion to the more fascinating Espinasse. The friends of Espinasse obtained for her, through Duc de Choiseul, an annuity from the king. Her *Lettres,* etc. (Paris 1809), show her remarkable cultivation.

ESPINEL, *ĕs-pē-nĕl′,* VINCENT DE: 1551, Dec. 28—1634: b. Ronda in Granada: Spanish poet and musician.

Studied at Salamanca, afterward entered the army, and travelled as a soldier through Spain, France, and Italy, meeting with the adventures which he relates in his *Relaeciones de la Vida y Aventuras del Escudero Marcos d, Obregon* (Madr. 1618, later 1804; in German, by Tieck-Bres. 1827). He afterward returned to his native country. entered into holy orders, and received a benefice in Ronda, his native town. He was subsequently chaplain in the royal hospital at Ronda. The last years of his life were spent at Madrid, in the retirement of the monastery of *Santa Catalina*, where he died. He published a book of poems (Madr. 1591), chiefly lyrics, and a translation of the *Epistola ad Pisones*, the *Ars Poetica* of Horace. He was, if not the inventor, the improver of the ten-line octosyllabic stanza. Verses in this form have, since Espinel's day, been called in Spain *Espinelas*. He was a performer on the guitar, to which he added the fifth string.

ESPINHACO, *ĕs-pēn-yâ'so* (SERRA DO): mountain-chain of Brazil, extends in a direction generally parallel with the coast, from the right bank of the San Francisco to the head-waters of the Uruguay. Its n. part forms the e. limit of the basin of the former river. The Serra, as a whole, is said to be rich in diamonds.

ESPIONAGE, n. *ĕs'pē-ō-nāj'* or *-nâzh'* [*espionnage*, act of spying—from *espion*, a spy—from It. *spione*]: the practice of watching the words and conduct of others, generally from unworthy motives; the practice of employing others as spies or secret agents.

ESPIRITU SANTO, *ĕs-pĭr'ĭ-tô sân'tō* or *ĕs-pē'rĭ-tô sân-tō* (long applied by the Spaniards to their imaginary continent in the s. hemisphere): largest and most westerly island of the New Hebrides, lat. 15° s., and long. 167° e., said to measure 80 m. by 40.

ESPIRITU SANTO: cape of Tierra del Fuego, lat. 52° 38′ s., long. 68° 37′ west.

ESPIRITU SANTO: bay of the Gulf of Mexico, forming part of the almost continuous back-water of Texas; lat. 28° 30′ n., and long. 97° 30′ w. Toward the open sea, it is breasted by Matagorda Island, and on the side of the mainland, it receives the Guadaloupe.

ESPIRITU SANTO: small maritime province of Brazil, extending in s. lat. 18° 30′ to 21° 20′; immediately n. of the metropolitan province of Rio Janeiro. It contains also a town and bay of its own name. Pop. 135, 997.

ESPIRITU SANTO: town near the centre of Cuba; pop. 9,982, fully one half being whites.

ESPLANADE, n. *ĕs'plă-nād* [F. *esplanade*, a planing, a levelling—from It. *splanata* for *spianata*, a levelled way—from L. *plānŭm*, level ground, a plain]: level ground within a fortified place or adjoining it, used for exercise, etc.; properly, the space between the fortifications or of the town and the glacis of the citadel. It requires to be at least 800 paces broad, that the enemy, in case of his getting

possession of the town, may not be able to assail the citadel under cover of the nearest houses. For this purpose, the citadel must command the esplanade, and be able to send a direct fire into the streets opening upon it. In old works on fortification, the term is often applied to the glacis of the counterscarp, or the slope of the parapet of the covered way toward the country.

ESPOUSE, v. *ĕs-powz'* [F. *éspouser;* OF. *espouser*, to wed: OF. *espouse*, a spouse, a wife—from L. *sponsa*, a betrothed one; *sponsus*, promised solemnly]: to promise or engage in marriage by a written contract; to betroth; to marry; to embrace or adopt, as a cause or opinion. ESPOU'SING, imp. ESPOUSED', pp. *-powzd'*, married; wedded. ESPOU'SAL, a. *-zăl*, relating to the act of espousing: N. act of espousing of betrothing; adoption. ESPOU'SALS, n. plu. *-zălz*, the act of contracting a man and a woman to each other in marriage. ESPOU'SER, n. *-zĕr*, one who. ESPOUSE'MENT, n. *-powz'-mĕnt.*

ESPRINGAL, *ĕs-prĭng gal*, or SPRINGAL, *sprĭng'gal:* in *milit. eng.* before the days of gunpowder, a machine for throwing missiles. These missiles were either large darts, called *muchettes*, or arrows winged with brass and called *viretons*, from their whirling motion when shot forth.

ESPRIT, n. *ĕs-pre'* [F. *esprit*, spirit—from L. *spirĭtus*, spirit]: spirit, soul. ESPRIT DE CORPS, *-dĕ kōr'* [F. *esprit*, spirit, *de*, of, *corps*, body]: the prevailing spirit or disposition which binds men as members of the same society or profession.

ESPY, v. *ĕs-pī'* [F. *épier;* OF. *espier*, to watch—from It. *spiare*, to spy]: to see a thing at a distance; to discover something meant to be concealed or not very visible. ESPY'ING, imp. ESPIED', pp. *-pīd.* ESPI'ER, n. one who. ESPI'AL, n. the act of spying; in *OE.*, a spy; a scout. ES'PIONAGE, n. which see.—SYN. of 'espy': to discern; to spy; descry; discover; find out; perceive; watch; observe.

ESPY, *ĕs'pĭ*, JAMES P.: meteorologist: 1765 (May 9)–1860, Jan. 24; b. in w. Penn.; son of a farmer. He received a superior education, and was a classical and mathematical instructor in Philadelphia; but became enthusiastic in meteorology, and gave up teaching. His first course of lectures was before the Franklin Institute of Pennsylvania. Espy's theory of storms (with which his name is specially connected) drew general attention: see STORMS. His memoir on this subject gained, 1836, the Magellanic premium of the American Philosophical Soc. of Philadelphia. In 1841 appeared his work on the *Philosophy of Storms*, regarding which the Report of the *Académie des Sciences* (Paris) says, 'that the theory on which it is based alone accounts for the phenomena. . . . It redresses many accredited errors.' Later in his life, Espy became prof. in the Philadelphia High School, and afterward in the Franklin Institute. He travelled extensively through the United States, lecturing on his favorite theory of storms, and studying the laws of climate, until he acquired the popular title of the 'Storm-

king.' After the organization of the Smithsonian Institution at Washington, he was commissioned by Dr. Henry, its superintendent, to pursue his researches. In the halls of the Smithsonian were made his experiments on the rate of cooling of gases of different densities when expanded. The cooling effects of expansion on dry and moist air also formed the subject of nice experiments. The results of these experiments have thrown much light on the formation of cloud and rain, and the propelling power of winds. They afforded materials for his elaborate and valuable reports on meteorology, of which the last was issued 1857. He died in Cincinnati.

ESQUIMALT, *ĕs'kė-mâlt:* small port at the s. end of Vancouver Island, on Juan de Fuca Strait; important as a British naval depot, the only one on the w. coast of the American continent. See VICTORIA (city in Brit. Col.).

ESQUIMAUX, n. sing. or plu. *ĕs'kĭ-mō* [a French spelling of a native name, *eskumaget*, he eats raw flesh—a nickname given to the Arctic tribes by the N. Amer. Algonquin Indians]: tribes of diminutive stature inhabiting the northern seaboard of America and Asia, and the Arctic islands: ESQUIMAU, as a sing. form, is rarely used. ESKIMO, *ĕs'kĭ-mō* (also ESKIMOS), is a common spelling, and adopted in Greenland. They are found on the coasts of all the seas, bays, inlets, and islands of America n. of the 60° of n. lat.; from the e. coast of Greenland, long. 20°, to the Strait of Behring, long. 167° w. On the Atlantic, they are found along the entire coast of Labrador to the Strait of Belleisle, and down the e. side of Hudson's Bay nearly as far as James's Bay; while on the Pacific they reach as far as the peninsula of Alaska. They are found also on the Asiatic side of Behring's Strait, and though few in number, may be regarded as the most widely spread nation in the world, occupying, according to Mr. Gallatin, not less than 5,400 m. of coast, without including the inlets of the sea. 'The Eskimo,' says Dr. Latham, 'is the only family common to the old and new world—an important fact in itself, and one made more important still by the Eskimo localities being the only localities where the two continents come into proximity.' Nothing, however, has as yet come out of a consideration of this fact in the way of tracing, with absolute certainty, a connection between the E. and any well-defined Asiatic race. The name itself, *Esquimaux*, or *Eskimo*, does not help in any such attempt, being not the native name, for they called themselves 'Inuit,' or 'people;' the Scandinavians of the 10th c. called them 'Skroellingar,' or 'wretches;' while the seamen of the Hudson's Bay ships designate them as 'Seymos,' or 'Suckemos,'—appellations, according to Richardson, 'evidently derived from the vociferous cries of Seymo or Teymo with which the poor people greet the arrival of the ships.' The E. are usually reckoned by ethnologists to belong to the Mongolian race, but Duponceau and Gallatin find a strong resemblance between them and the Red Indians of N. America, the view also of Prichard—the

last mentioned regarding them as a kind of link between the N. Asiatic and American family of nations. Latham, on the other hand, pronounces them Mongolian in physiognomy, with flat nose, projecting cheek-bones, eyes often oblique, and skin more brown than red or copper colored; thus presenting a marked contrast to the N. American Indians. Their language, however, is, he acknowledges, American in grammatical structure, being composed of long compound words, and regular, though remarkable, inflections. With respect to the complexion of the E., Sir John Richardson is of a different opinion from any of these authors, describing it as nearly white, when relieved from the smoke and dirt with which it is usually incrusted. Many of the young women, he considers, may even be called pretty, when this operation has been performed. 'The young men,' he says, 'have little beard; but some of the old ones have a tolerable show of long gray hairs on the upper lip and chin, which the Red Indians never have, as they eradicate all stray hairs. The Eskimo beard, however, is in no instance so dense as a European one.' In stature, the E. are usually represented as not more than five ft. in height; but the authority just mentioned describes them as ranging from five ft. to five ft ten inches, and even more. They are broad-shouldered, and, when seated in their boats, look tall and muscular, but, when standing, appear to lose some of their height, from the shortness of their lower extremities. The E. live usually throughout their long lines of coast in small villages, containing about five or six families each. The men occupy themselves entirely in hunting, while the women perform the domestic drudgery, which consists principally in preparing the food, of which both sexes consume a large quantity. This is almost entirely of an animal nature, but not without variety, embracing the reindeer, geese, and other birds, the seal, walrus, salmon-trout, and various other fish. They are expert hunters and fishers, and, aided by their dogs, make considerable havoc among the arctic animal tribes. Where whales are common, August and September are devoted to the pursuit of these animals, and great joy is manifested when they capture any of them, as from the blubber of these they get their supply of oil for lights in the long winter season. Of vegetables, they scarcely taste except in autumn. 'Carbon is supplied to the system by the use of much oil and fat in the diet, and draughts of warm blood from a newly killed animal are considered as contributing greatly to preserve the hunter in health.' The habits of the E. are filthy and revolting in the extreme. A great part of their food is consumed without any attempt at cooking it, and they drink the blood of newly killed animals as the greatest delicacy. In the short summer, those who can afford it live in tents; but in the winter they all equally live in snow-huts, the stench of which, from the offal with which they are stored, and the filthy oil that gives them light, makes them insupportable to the European. The dress of both sexes is nearly the same, consisting of the skins of animals, rein-

deer, birds, and even fish—whatever conduces most to warmth, without much regard to appearance; but in their winter abodes they usually wear nothing except trousers. Their religion consists principally in superstitious observances, but they believe, we are told, in two greater spirits, and many lesser ones The Moravian mission in Greenland, commenced by the benevolent Hans Egede (q.v.), 1721, has succeeded in converting many to Christianity; and they are represented by the missionaries to be a mild and teachable people, easily led by kindness to distinguish between what is morally right and wrong. Where the missionaries, however, have not penetrated, arctic voyagers generally speak of them as honest among themselves, but incorrigibly dishonest, and prone to lying and exaggeration with strangers.—See Dr. Rink's *Tales and Traditions of the Eskimo.*

ESQUIMAUX′ DOG: kind of dog extensively spread over the most northern regions of N. America and of e. Asia; large, powerful, with long rather curling hair, tail much curved over the back and very bushy, short and pointed ears, and somewhat wolf-like aspect. These dogs are much used for drawing sledges. They are very saga-

Esquimaux, Dogs, and Sledge for one person.

cious, docile, and patient. The color is generally black and white, brown and white, or dingy white.

ESQUIRE, n. *ĕs-kwīr′* or *ĕs′kwīr* [F. *écuyer;* OF. *escuyer*, one who attended on a knight and bore his lance and shield —from It. *scudiere*—from L. *scūtārĭus*, the shield-bearer—from *scūtum*, a shield]: in *chivalry* the shield-bearer or armor bearer to the knight, and hence was called *armiger* in Latin. He was a candidate for the honor of knighthood, and thus stood to the knight in the relation of a novice or apprentice, much as the page did to him. In this capacity he was spoken of as a bachelor, just as the knight-bachelor came latterly to be distinguished from him who had already attained to the higher honors of chivalry. When fully equipped, each knight was attended by two esquires. The

esquire was a gentleman, and had the right of bearing arms on his own shield or escutcheon, which is surmounted by a helmet placed sideways, with its vizor closed, to distinguish him from a knight or nobleman. He had also the sword, the emblem of chivalry, though he was not girded with the knightly belt. His spurs were silver, to distinguish them from the golden spurs of the knight; and when the king created esquires of old, it was by putting silver spurs on their heels, and collars of SS round their necks. Those who received this honor directly from the sovereign were in general the esquires for the king's body, or those whose duty it was to attend him in his capacity of a knight; an office now nearly obsolete. Tenants of the crown who held by knight's service were a class of feudal esquires generally supposed to correspond to the simple *ritters* or knights of Germany, as opposed to the *ritters* who were *geschlagen* or dubbed, inasmuch as these English esquires were entitled to claim the rank of knighthood. Though the title of esquire has now come to be given almost without discrimination, the following seem to be those whose claim to it in Britain stands on the ground either of legal right or of long-established courtesy: 1. All the untitled sons of noblemen; 2. The eldest sons of knights and baronets; 3. The sons of the younger sons of dukes and marquises, and their eldest sons. All these are esquires by birth. Then there are esquires by profession, whose rank does not descend to their children; and esquires by office—e. g., justices of the peace—who enjoy the title only during their tenure of office. To the former class belong officers in the army and navy, barristers and doctors of law, and doctors of medicine, but not surgeons.

ESQUIROL, *ĕs-ke-rol'*, Jean Etienne Dominique: 1772, Jan. 4—1840, Dec. 12; b. Toulouse: one of the greatest physicians for the insane of modern times. He served in the military lazaretto at Narbonne 1794, obtained his degree of doctor 1805, and was appointed physician to the Salpêtrière at Paris 1811. After 1817, he delivered clinical lectures on the diseases of the mind, and their cures; in 1818, his exertions secured the appointment of a commission, of which he became a member, for the remedy of abuses in mad-houses; in 1823, he became inspector-gen. of the univ.; and in 1825, first physician to the *Maison des Aliénés*. In the following year, he was appointed also principal physician of the private lunatic asylum at Charenton, which he had organized. At the July revolution, he lost all his public offices, and withdrew into private life. E. combined rare qualifications for a physician of the body and the mind. By his humane and moral treatment of the insane, he often effected the happiest cures. His writings embrace all the questions connected with the treatment of insanity, and his special attention was given to the construction of suitable buildings for the insane. His most important work is *Des Maladies Mentales considérées sous les Rapports, Médical, Hygiénique et Médico-légal* (1838).

ESQUIROS, *ĕs-ke-rōs'*, Henri Alphonse: 1814–1876.

May 13; b. Paris: poet and romancist; representative in the national assembly. He made his *début* as an author 1834, with a vol. of poems, *Les Hirondelles*, highly praised by Victor Hugo, but having a very limited sale. Two romances followed, *Le Magicien* (1837) and *Charlotte Corday* (1840). About this time he published a philosophic commentary on the life of Christ, the *Evangile du Peuple* (1840), for which he was prosecuted, and sentenced to eight months' imprisonment and to a fine of 500 francs, 1841, Jan. 30. In the same year he published his *Chants d'un Prisonnier*. His *Histoire des Montagnards* appeared 1847. After the revolution of 1848, Feb., E. was elected a member of the legislative assembly. Distinguished by his radical opinions, he was included, after 1851, Dec. 2, among members to be expelled; on which he retired to England. His *La Vie Future au Point de Vue Socialiste* appeared 1857; and *La Morale Universelle L'Angleterre et la Vie Anglaise;* and *La Neerlande et la Vie Hollandaise*, 1859. In 1869, he was returned to the corps legislatif, and was appointed supreme administrator of dept. Bouches de Rhone by the govt. of the National Defense 1870. In 1871 he was returned to the national assembly, and 1876, Jan., was made a member of the senate. He died at Versailles.

ESS, *ĕs*, Heinrich Leander van, or Johann Heinrich van: 1772, Feb. 15—1847, Oct. 3; b. Warburg, Westphalia: German Rom. Cath. theologian. He joined the Benedictine order in Paderborn 1790, was ordained priest 1796, was pastor at Schwalenberg 1799–1813, and prof. extraordinary of theol. at Warburg Univ. 1813–22. In conjunction with his cousin Karl van E. he published a German translation of the New Test. (Brunswick 1807; 20th ed. Sulzbach 1830), and independently one of the Old Test. 1819. In order to encourage the reading of the Bible by German Rom. Catholics, he prepared a large number of translations, tracts, and essays; but this course was censured by the German Rom. Cath. bps. and the pope, and this led him to resign his professorship and enter on a life of seclusion. After his death his library of between 13,000 and 20,000 vols., rich in early editions of the Bible and mediæval and reformation literature, was bought for the Union Theol. Seminary (Presb.), New York.

ESSAAD-EFFENDI, Mohammed: Turkish historian; b. Constantinople, 1790, Dec. 16. He was surnamed Sahaf-Zadeh, 'son of the bookbinder,' on account of his father having been president of a corporation of bookbinders and librarians. At the age of 18, he became a teacher; in 1825, he was appointed historiographer to the Ottoman empire. In 1831, the superintendence of the *Tatawin-i-wekaïi* (Table of Events), the official journal of the empire, was placed in his hands. In 1835, he was employed by the late Sultan Mahmoud on an embassy to Mohammed, son and successor of the king of Persia. E. had also the titles of grand judge of Roumelia, inspector-gen. of schools, and member of the council of public instruction.

Among the works of E. are *Uss-i-Tzafer* (Establishment

of Victory), translated into French, published by M. Causin de Perceval, entitled *Historic Summary of the Destruction of the Janizaries by the Sultan Mahmoud in* 1826 (Par. 1833).

ESSAY, n. *ĕs′sā* [F. *essayer*, to try—from L. *exāgĭŭm*, a trial of exact weight, proof by examination: F. *essai*, an essay, a sketch]: an attempt; an endeavor, an effort; a trial or experiment; a written composition on a practical subject, less formal or extended than a *treatise*. Es′SAYIST, n. *-ist*, writer of an essay: V. *ĕs-sā′*, to attempt; to try; to endeavor. ESSAY′ING, imp. ESSAYED′, pp. *-sād′*. ESSAY′ER, n. one who. *Note.*—ESSAY AND ASSAY are radically the same word.—SYN. of 'essay, n.': exertion; experiment; effort; treatise; tract; dissertation; disquisition; monograph.

ESSAYS AND REVIEWS: title of a volume published London, 1860, Mar., written by seven prominent members of the Church of England, in more or less opposition to the Tractarian principle of Oxford. They may be deemed representative of the 'Broad Church' views. It was severely censured by the majority of the bps. and a large number of the clergy, and was condemned by a convocation 1864, June 24. In the meantime two of its authors (Rev. Dr. Williams and Prof. Wilson) were tried by ecclesiastical courts and sentenced to suspension for a year and the payment of costs; but the sentences were subsequently reversed by the privy council. A third, Rev. Dr. Temple, was strongly opposed by the English Church Union when nominated to be bp. of Exeter, 1869, Oct., but ineffectually. The Essays and Reviews were: *The Education of the World* by Rev. Dr. Frederick Temple; *A Review of Bunsen's Biblical Researches*, Rev. Dr. Rowland Williams; *The National Church*, Prof. Henry B. Wilson; *The Interpretation of Scripture*, Prof. Benjamin Jowett, *Tendencies of Religious Thought in England*, 1688–1750, Prof. Mark Pattison; *On the Study of the Evidences of Christianity*, Prof. Baden Powell; and *The Mosaic Cosmogony*, Charles Wycliffe Goodwin (layman).

ESSEG: see ESZEK.

ESSEN, *ĕs′sĕn:* town in Rhenish Prussia, between the Rhur and the Emscher, 20 m. n.e. of Düsseldorf, in a rich coal and iron district. The town is surrounded by the high chimneys of the steam-engines used in working the mines. As it has risen only very recently to its present importance, its architectural beauties are not great; it has, however, an imposing cathedral, containing many curious reliquaries, crosses, etc. Essen owes its prosperity to the inexhaustible coal-mines in its vicinity, to which are due extensive works for all sorts of manufacture in iron. The enormous works of Herr Krupp, discoverer of the method of casting steel in very large masses, who employs about 20,000 men, are at Essen. At them are manufactured many articles for peaceful purposes, but the gigantic steel guns which the Germans used with such terrible effect at the siege of Paris (1870–1) have made the name of Krupp

world-renowned. The annual production is about 330,000 tons of steel, and 26,000 tons of iron. Around the works of this great manufacturer quite a city has been formed. Largely through his liberality, excellent houses have been erected for the workmen, and are rented for a very moderate price. Churches have been built; schools of various kinds, including a work-school for women and an industrial school for girls, have been established; a public library is maintained; and places of amusement are provided. Aged employés are pensioned, free medical attendance is supplied for the sick, and hospitals have been erected for treatment of the injured. Fire and life insurances are provided at low rates, and the burdens brought by sickness are lightened by associated effort. There is also a system of practical co-operation through which the workmen obtain their food and other supplies at reduced prices. Thus, in various ways, the social life of the people is made pleasant, and their health and material prosperity are promoted. Although the industrial activity of Essen is recent, the town itself dates from the foundation of the Benedictine nunnery 873. Pop. (1900) 118,862.

ESSENCE, n. *ĕs'sens* [F. *essence*—from L. *essentĭă*, the being of anything—from *esse*, to be: It. *essenzia*]: in *philosophy*, that which constitutes the particular nature of a being or substance; that without which a thing cannot be itself; existence; being; in *OE.*, cause of existence; used by modern writers generally as a synonym for *substance* (q.v.); yet these two words being often vaguely used, it is necessary to fix the author's meaning in each case. In *chem.*, etc., the concentrated preparation of any substance; a perfume; the virtues or qualities of a thing separated from its grosser matter; solutions of the essential oils in alcohol; prepared (1) by adding rectified spirit to the odoriferous parts of plants, or to the essential oils, and distilling; or (2) simply by adding the essential oil to the rectified spirit, and agitating till a uniform mixture is obtained. Thus the essence of lemons is merely a solution of the volatile oil of lemons in rectified spirit. ESSENCE D'ORIENT, n. essence of pearls; liquor prepared from a nacreous substance found in the scales of a fish called the bleak. It is used in the manufacture of artificial pearls. ESSENCE DE PETIT GRAIN, product of distillation from small unripe oranges about the size of a cherry; used as a perfume, like *Orange-flower water*. ES'SENCED, a. *-ĕnst*, perfumed. ESSEN'TIAL, a. *-sĕn'shăl*, indispensably necessary; important in the highest degree; requisite; pure: N. existence; first principle; chief point; that without which the thing named is non-existent. ESSEN'TIALLY, ad. *-shăl-lĭ*. ESSEN'TIALNESS, n. state or quality of being essential. ESSEN'TIAL'ITY, n. *-shĭ-ăl'ĭ-tĭ*, state or quality of being essential; essential nature or character. ESSENTIAL OILS: see OILS.

ESSENES, n. plu. *ĕs-sēnz'*: a sect among the anc. Jews, remarkable for their strict and abstemious life. ESSENISM, n. *ĕs'ē-nĭzm*, the doctrines or the practices of the Essenes.

ESSENES.

The word has been variously derived from Hebrew, Greek, Syriac, or Aramaic roots, meaning pious, silent, heal, do, see, strong, bathe. This small religious fraternity among the Jews, are involved in obscurity as to their name and origin, as well as character and history. Still, in the wide field of the history of Semitic religions, few subjects have greater importance or interest. The Essenes bore one of the most momentous parts in the development of Judaism. Christianity stands in so close connection with them, that John the Baptist and Christ himself have been pronounced by some to have originally issued from their ranks. More surprising than all, out of Essenism, in the stage of Sabæism, has sprung Islam itself, and in this last development of its tenets and practices are still preserved some of its principal rites. It is but natural that from the days of the Fathers to our own, numberless writers, more or less qualified, should have endeavored to throw light on this mysterious brotherhood, but with results far from satisfactory, because of the obvious limitation of the sources which were consulted. Josephus, Philo, Pliny, Solinus, Eusebius, and the Fathers, generally, were considered the only sources, from which the genuine history of this fraternity could be deduced. Of these, Pliny indeed has a geographical notice, which cannot be traced to either Philo or Josephus; but the rest have so evidently derived their shallow and contradictory accounts indirectly, and through corrupted channels, from those two writers, that they lose all claim to consideration. Of the two books of Philo in which information regarding the Essenes is contained, one (*De Vita Contemplativa*) is proved to have been written about three centuries after Philo's death by a Christian monk as a panegyric on ascetic monachism. The other (*Quod Omnis*) is, to say the least, of doubtful genuineness, and is, moreover, at variance with Josephus. As to Josephus himself, it is now generally allowed that his Essenes stand in much the same relation to the historical Essenes as the ideal inhabitants of the *Germania* of Tacitus stand to the real Germans of his time. Strange that for so many centuries the real sources—the Talmudical writings—should not have been thought of. These, *together* with Josephus and Philo, Pliny, and the Arabians Macrisi and Abulfarag, will perhaps better enable us to form an idea, not only of the real state of this community, but, what is of no less moment, to trace the process by which they gradually arrived at their peculiar mode of life and worship.

Epitomizing facts and conclusions, we have to premise that exception must be taken to the opening statement of Josephus, that there were three different 'sects' among the Jews: the Pharisees, the Sadducees, and the Essenes —a statement copied and accepted till the present day. The Sadducees were a political party, nothing more or less, and, as a matter of course, held religious views antagonistic to, or rather they did not accept the traditions of their adversaries, the Pharisees, who, again, forming as they did,

the bulk of the nation, cannot rightly be called a *sect.* Neither can the Essenes be called properly a sect; they were rather an inner circle or association within the wide national company of Pharisees. They were Pharisees of stronger convictions, and carried out the Pharisaic views with a consistency which made them ridiculous even in the eyes of their own mother-party (Sota, 26, a.); neither were they known by the names of Essenes, this being a very late designation, derived either from a Chaldee word *Sacha*, and meaning Bathers, or Baptists; or from *Asa*, meaning Healers. The Mishna, Beraitha, and Talmud speak of these advanced Pharisees in general as Chasidim (*Assidaioi*, Pious Men), Nazirim (Abstinents), Toble Shachărith (Hemero-baptists), Banai (Builders), and Chaberim (Friends). The Arabic book of *Maccabees* calls the Essenes simply *Assidaioi*, and Macrisi speaks of 'Nazirs, Essenes, and Baptists' as *all* being 'Asaniun,' or Essenes.

The Nazirhood, a kind of voluntary priesthood, enjoining abstinence from wine, flesh, and other sensual enjoyments, had in the troubleous times of anti-Syrian agitation. and the general upheaving of society, found numerous adherents (*Tosifta Nazir*, c. 4; *Talm. Babli Berach.* 48, a 1; *Macc.* ii. 49; Jos. *Antiq.* xviii. 1); and gradually there sprang up contrary to the biblical example, which restricts this asceticism to a certain period, a host of men calling themselves 'Nazirs for ever'—Nazire olam (*Nazir*, 4, a.). Pharisees of a spiritual and contemplative bias, with no natural taste for the conflicts and activity of political or public life, or wearied, perhaps with the vanity of human aims, took this vow of Nazirship for life, and constituted themselves into a sort of religious club. Levitical purity in its strictest and highest sense made them draw closer and closer the innumerable '*fences*' which the traditional law had erected round the biblical law. Any one, friend or foe, could at any moment, by having touched something impure, disturb this purity for the time, and necessitate new and endless purifications. Thus it became necessary, or at least expedient, that those among them who could break all ties of friendship and family, should retire into a solitude not easily approachable by a stranger to their community. Food could not be prepared save by those of the brethren who knew and strictly obeyed the hyper-traditional injunctions. Their dress, every implement of daily use, had to be made under similarly stringent laws of purity. A natural consequence of this their exalted notion of outward priesthood, was—the different phases of woman's life taken into consideration—their general celibacy. (The explanation given by Josephus—The fear of the corruption of both towns and women—is entirely gratuitous, and utterly in discordance with the Jewish notions of the time.) In this state of voluntary isolation, trading was out of the question; they tilled the ground and lived on the fruits of the earth. Taking their meals, and these of the coarsest and plainest description, in common, they idealized the table into an altar, and, prayer having been said, they

remained standing silently round it during the repast. That they had no individual property, follows of course, and their communistic motto, which the Mishna (Aboth) has preserved to us—'Mine is thine, and thine is mine' —explains itself. We need not enlarge further on their small eccentricities—on the white linen garment, the apron (kenaphaim), the scoop or shovel; they, one and all, are signs and symbols of Levitical purity, the scoop reminding us of a certain Mosaic ordinance during the wanderings in the desert, the apron becoming necessary from the frequent ablution of their hands. Every morning, they bathed, like the priests who ministered in the temple, in pure spring water. They abhorred blood as a source of impurity, and for this reason, probably, some of them abstained also from going up to the temple, where sacrifices were daily offered; others are recorded as present at a festival in the temple (Succah, 51, 53). Their offerings were sent alive under the care of messengers. But these were but outward signs of purity, stepping stones to inner piety, to communion with God, which was to be acquired, according to their notion, only by solitude and an ascetic life. The belief in the efficacy of the most rigid simplicity and willing self-sacrifice, they held in common with the Pharisees; but their horror of oaths, their frequent prayers, their occupation with mystical doctrine, were their own. Untroubled by the noise of war or the strife of parties, leading a life divided between the bath, ablutions, contemplation, and prayer; despising the body and bodily wants; what more natural than that by degrees they should be led into a kind of mystical enthusiasm and fanaticism.

Angelology, derived from the Magi, formed a prominent feature of their creed. In the course of time, they were viewed by the vulgar as saints and workers of miracles. A wonderful book of cures (*Sepher Refuoth*), which Talmudic, Arabic, and Byzantine authorities ascribe to Solomon, was in their hands, and with this, 'by the aid of certain roots and stones,' by the imposition of hands, and certain whisperings—a practice strongly condemned by the Pharisees (Synhedr. 90, a.)—they cast out demons and healed the sick. Philosophy they regarded so far only as it treated of the existence of God. Jehovah is the original light; from him proceed a number of spirits (the Platonic Ideas), and at their head stands the Wisdom, or *Logos*, into which, after death, the soul is again absorbed. Their code of Ethics was threefold—the love of God, of virtue, and of man; their scale of perfectibility reaching its acme in the communion with the Holy Ghost (*Ruach Hakodesh*), (Mishn Sota, 99). In fine, mixing up, in the strangest manner, the most exalted and the most puerile notions, they became forerunners of the Gnostics and Cabalists. Historically their origin is to be traced to Chasidim of the pre-Maccabean era, of whom the Pharisees are also offshoots. They were the extremists among the latter who preferred asceticism to avoid sin and who insisted on the highest standard of purity and holiness. Ever in hope of the

Messianic time, the members of this brotherhood kept in touch with each other; they organized Jewish communities and promoted benevolence, being not wholly devoted to pious contemplation. On the rise of Christianity, many became Therapeutæ or Christians, whose early rites had marked similarity to their own. There is no lack of literature on the Essenes; besides Herzfeld, Graetz, Jost and Ewald, and early magazine articles by Frankel, can be consulted Ginsburg, *The Essenes, etc.* (Lond. 1864); Schürer, *Gesch*; Weinstein, *Beiträge zur Gesch. der Essäer* (Venice 1892).

ESSENTIAL, etc.: see under ESSENCE.

ESSEQUIBO, *ĕs-sā-kē′bō:* most westerly of the great rivers of British Guiana, rising in the Acarai Mountains, 41 m. n. of the equator, and after a course of 620 m. entering the Atlantic near the Venezuelan frontier, forming an estuary 20 m. wide, in which lie numerous fertile islands. The Essequibo receives numerous large tributaries, as the Cuyuni and Mazaruni; on the Potaro, another affluent, is the magnificent Great Kaietur Fall, more than 700 ft. in sheer descent, discovered 1870. On the banks of the Essequibo are forests of locust-tree, iron-wood, ebony, greenheart, and other fine timber trees, festooned with orchids, and laced together with lianas and other climbing plants. Beyond the forests are vast savannahs, formerly forests destroyed by fire, and now swamps of brushwood, reeds, and coarse grass. The Essequibo is navigable for large ships to the first cataracts, about 60 m. from the sea. The country of Essequibo has not prospered so much as Demerara and Berbice. Many of the old plantations are out of cultivation. Pop. 27,000, exclusive of 2,000 Indians.

ESSERA, n. *ĕs′sėr-a* [F. *esséré;* of Arabic derivation]: in *med.*, species of cutaneous eruption, consisting of small reddish tubercles over the whole body, accompanied by a troublesome itching. It seems to be a kind of lichen or urticaria.

ESSES, COLLAR OF: see SS, COLLAR OF.

ESSEX, *ĕs′ĕks:* maritime county of the s.e. of England, having the North Sea on the e.: the Thames estuary, dividing it from Kent, on the s.; Middlesex and Hertford on the w.; and Cambridge and Suffolk on the north; greatest length from n.e. to s.w. 63 m., greatest breadth from e. to w. 54 m. It has 1,055,161 statute acres, nine-tenths being arable or in grass, and a twentieth in wood. The coastline is 85 m. long. Some cliffs at the Naze are 35 ft. high. The centre and north of the county are beautifully diversified and richly wooded, the highest point being Langdon Hill, 620 ft. above the sea. Besides the Thames, the chief rivers are the Stour, 50 m. long; Blackwater, 46 m.; Lea, Roding, Crouch, and Chelmer. The e. of the county is mostly on London clay, with limestone beds near Harwich. In the middle and north, there is much diluvium, with chalk fragments. Crag occurs near Harwich, and stones of phosphate of lime are found here and there. Es-

sex has few manufactures, except in the neighborhood of London, where are chemical works, tar, and other works of a kind that could not be carried on in a large scale within the metropolitan boundaries. The Thames Iron-work and Ship-building Company, near the new Victoria Docks, are another manufacturing feature of the county. At Colchester, is a great silk-mill, also at Bocking, Braintree, and Halstead. Tambour lace is made at Coggeshall and a few other places; there is straw-plaiting in some of the similar towns, but the country has comparatively few distinctive manufactures. The chief crops are wheat, barley, oats, beans, potatoes, saffron, caraway, and hops. Great numbers of calves are fattened for the London market, and there are large sheep-flocks. Essex has valuable oyster fisheries. The county is almost entirely in the diocese of Rochester. Essex returns eight members to parliament. Essex was once forest-land, and the seat of a powerful tribe, the Trinobantes, whose famous chiefs, Caractacus and Boadicea, were overthrown by the Romans. Essex constituted part of the Roman *Flavia Cæsariensis.* It has afforded many Roman remains, and a Roman road once passed through Colchester, which was an important Roman station. The Saxon kingdom of Essex included London and parts of Middlesex, Hertford, Bedford, and Essex. Pop. (1901) 816,513.

ESSEX, Robert Devereux, Earl of: 1567, Nov. 10 —1601, Feb. 25; b. Netherwood, Herefordshire; son of Walter Devereux, first earl of Essex. He entered Trinity College, Cambridge, at the age of ten, where he remained for four years. Lord Burleigh, to whose guardianship he had been intrusted, introduced the handsome and gifted youth at court 1584. Here, by his agreeable manners, his appearance, and talents, he established himself among troops of friends, and gained the special favor of Elizabeth. In 1885, he accompanied the Earl of Leicester to Holland, where he distinguished himself at the battle of Zutphen, and on his return to England was made master of the horse and knight of the Garter. After the death of Leicester, Essex continued to rise in the favor of Elizabeth, who loaded him with honors. In 1591, he commanded the forces sent to the assistance of Henry IV. of France against the Spaniards, but achieved no success. The next few years were spent in endeavoring to get the better of Burleigh—the wisest, the most prudent, and the most politic of all Elizabeth's advisers. In 1596 Essex was appointed joint-commander with Lord Howard in the expedition against Spain, to which Burleigh was strongly opposed; and though Essex displayed all his wonted courage, and contributed to the capture of Cadiz, which caused immense loss to the Spainards, yet the expedition resulted in nothing, and Essex had to defend himself against various accusations on his return. In 1597, he was made earl marshal of England, and, on the death of Lord Burleigh, chancellor of Cambridge. In 1598 occurred the first fatal mistake in Essex's career. Presuming upon Elizabeth's ad-

miration and feminine fondness for his person, he differed from her about some trifling matter, and angrily and rudely turned his back upon her in the presence of some of the council, and her majesty, whose language was hardly more delicate than her father's, gave him a vigorous box on the ear, telling him to 'go and be hanged.' A violent quarrel ensued, which, though apparently smoothed up, was never really so. Essex was afterward, 1599, sent to Ireland—part of which at that time was in a state of rebellion—as lord-lieut. of that country; but here his government was ill-advised and ineffectual, and after a few unimportant undertakings, he concluded a truce with the rebels, which was regarded at court as high treason. To confront his enemies, he hastened back to London, contrary to the queen's express commands, and forced his way into Elizabeth's bedchamber. Justly offended, the queen deprived him of his dignities, and commanded that he should be called to account for his behavior. Essex, advancing from one degree of foolhardihood to another, tried to excite an insurrection in London. He was imprisoned, tried, and found guilty. Elizabeth long delayed signing the warrant for his execution, in the hope that he would implore her pardon. He was beheaded, after defending himself with pride and dignity. Essex was rash, bold, and presumptuous; but brave, generous, and affectionate, and the friend and patron of literary men.

ESSEX, *ĕs'sĕks*, Robert Devereux, Earl of: 1591–1646 Sep. 14; b. London: soldier. When 11 years old he was restored by James I. to the rank and titles held by his father, the second earl, and became a companion of the young Prince of Wales; and when 15 years of age was married to Frances Howard, daughter of the Earl of Suffolk and a year his junior, from whom he was divorced in 1613. He served in the army of the elector palatine in Holland 1620–23, was vice-admiral of an unsuccessful naval expedition against Cadiz 1625, and was lieut.gen. of an army sent by King Charles against the Scotch Covenanters 1639. Espousing the cause of the parliament against the king, he was appointed to the command of the parliamentary army at the beginning of the civil war, was victorious over Charles at Edgehill 1642, captured Reading 1643, and relieved Gloucester, but lost the greater part of his army 1644. He urged the impeachment of Cromwell before the house of lords, 1645, when Cromwell forced the adoption of the 'self-denying ordinance,' and Essex had to resign his commission. An annuity of £10,000 was settled on him for life.

ESSEX, Thomas Cromwell, Earl of: see Cromwell, Thomas.

ESSEX, The: an American 32-gun frigate built 1799 for the war with France. She was used as a Pacific convoy, and served later in the wars with the Barbary pirates. In 1812 Capt. David Porter did effective work with her: cutting out a brig with 197 soldiers from a British transport

fleet; forcing the 16-gun sloop Alert to strike in eight minutes; and in a cruise on the west coast of South America, capturing the entire British whaling fleet and other prizes, they and those destroyed aggregating $2,500,000 in value. In February 1814 two British vessels, the 36-gun Phœbe and the 18-gun Cherub, blockaded her in the neutral harbor of Valparaiso; on 28 Mar. he attempted an escape, but the vessel was disabled by a sudden gale, and in a fight of 2 hours and 20 minutes was cut to pieces, losing 58 killed and 66 wounded out of 255, and being left in a sinking condition. The battle was a mere massacre: the British had 38 long guns to the Americans' 6.

ESSEX EMERALD, n.: a geometer moth, *Geometra smaragdaria.*

ES-SIOUT: see SIOUT.

ESSLINGEN, *ĕs'lĭng-ĕn:* manufacturing town of Germany, kingdom of Würtemberg; near the right bank of the Neckar, in the centre of a pleasing and fertile district, seven m. e.s.e. of Stuttgart. It consists of the town proper, and five suburbs, and is surrounded by strong walls, and fortified by towers. The chief buildings are the *Frauenkirche*—a splendid edifice in the purest Gothic style, built 1440, surmounted by a spire 230 ft. high—the old and new town-house, and the old castle. It has the greatest machine-making trade of the kingdom, has manufactures of a wine called Esslingen champagne, of woolens, and cotton and woolen yarns, lacquered iron, silver-plate and tin wares, and paper, with good trade in wine and agricultural produce. Esslingen was founded in the 8th c., and received 1209 the rights of a free city of the German empire. The long and bloody quarrel between it and the House of Würtemberg ended at the peace of Lunéville (1802), when Esslingen, with its territory, was assigned to the duchy of Würtemberg.—Pop. (1900) 27,325.

ESSOIN, or ESSOIGN, n. *ĕs-soyn'* [OF. *essoīn*—from mid. L. *exŏnĭŭm,* business, occupation, an excuse for non-fulfilment of duty]: in *OE.,* a lawful excuse for an absent person, or for the absence of a person summoned to appear in court; a good cause of discharge for an impotent person.

ESSONITE, n. *ĕs'son-īt* [Gr. *hēssōn,* lower, less, because less hard than zircon, idocrase, etc., which it resembles]: in *mineral.,* cinnamon stone: cinnamon colored or yellow variety of grossularite or wilnite, which is a variety of garnet. Essonite is from Ceylon.

ESSORANT, a. *ĕs'so-rant* [F. *essor,* the soaring of birds]: in *her.,* term applied to a bird represented with its wings half open as though preparing to take flight.

ESSOUAN', or ESWAN': see ASSOUAN.

ESTABLISH, v. *ĕs-tăb'lĭsh* [E. *établir,* to establish: F. *établissant;* OF. *establissant,* establishing: OF. *establir*—from L. *stabĭlĭs,* that stands fast, firm]: to settle or fix firmly; to found permanently; to make firm; to constitute; to decree; to ratify. ESTAB'LISHING, imp. ESTAB'LISHED,

pp. *-lĭsht*: ADJ. settled firmly, as by law. ESTAB'LISHER, n. one who. ESTAB'LISHMENT, n. the act of establishing; a household; settlement; income; a place of trade; that which is fixed or set up permanently; a form of religion supported by, and in connection with, the state. ESTABLISHMENT OF THE PORT, a term employed to denote the interval between the time of high water at any given port, and the time of the moon's transit immediately preceding the time of high water, when the moon is at the new or full moon.—SYN. of 'establish': to confirm; fix; settle; institute; found; erect; set up; enact: ordain; uphold.

ESTAB'LISHED CHURCH: church established and maintained by a state for the teaching of Christianity in a particular form within its boundaries. Subsequent to the Reformation, many of the opinions which had given sanctity to the Church of Rome still kept possession of men's minds; among these was the notion, that the civil government of each state was bound to maintain a particular form of Christianity. The same fallacious reasoning which in more recent times has led to the search for one absolutely best form of civil government was at work then with reference to the church. The Rom. Cath. Church was not the best form—of that the Prot. states had become convinced—but all forms were not therefore indifferent; and if one was better than another, and another better than that, there must be an absolutely best, which the state was bound to discover, and when discovered, to substitute for that which had been abolished. The idea that the good or bad qualities of forms of goverment, whether civil or ecclesiastical, so long as they did not violate the fundamental doctrines of Christianity or morality, were relative, and not absolute, and that whilst one might be the best for men in one stage of development or of one particular temperament another form might be the best for others, did not belong to that age. Each Prot. state consequently established a church, conformity to the tenets of which it enforced, not upon only those who as ministers were henceforth to enjoy the property which in Rom. Cath. times had been devoted to the spiritual interests of the community, but very often on its own civil servants and advisers. The benefit of the arrangement was, that, to a greater or less extent, the means which the community had set apart for its own spiritual improvement were protected from the spoliation of private individuals; and this benefit was secured more effectually the more completely the new church took the place of the old—in England, for example, better than in Scotland; but as each of the Prot. states had substituted one form of church-govt. for another, and as the same form had not been adopted by them all, the idea of there being one form which was absolutely preferable to the others, though not abolished, was rudely shaken. In England, Queen Elizabeth had stated in her celebrated declaration, that she, as head of the church, 'would not endure any varying or departing in the least degree' from the doctrines of the

Episcopal Church of England as set forth in the Thirty-nine Articles; and yet Presbyterianism was established in England 1649. In Scotland, where Presbyterianism had first taken root, Episcopalianism had more than once become the law of the land. The effect of such occurrences was to counteract the belief in any one form as the form for all Christendom, and to facilitate dissent and the formation of sects. The pastors of these sects were not at first recognized by the law as entitled to any of the privileges of Christian ministers. Whatever they might be to their own flock, to the state they were laymen, and their churches were mere secular lecture-rooms, or, at most, places of meeting for private devotion. See NONCONFORMISTS; DISSENTERS; CHURCH; ETC. Gradually this view became modified, and the civil consequences attaching to sacred rites, when performed by a clergyman of the establishment, were extended to them when performed by dissenters: see MARRIAGE. But though many of the privileges, and all the liberties belonging to the established church, have now been extended to dissenting bodies, including Rom. Catholics (see ROMAN CATHOLIC EMANCIPATION) and Jews (see JEW), the established churches of England and Scotland are supported by the state, and guarded from spoliation by the coronation oath (q.v.). The grant to the Rom. Cath. college of Maynooth, and the *Regium Donum* (q.v.) to the Presb. ministers in Ireland, were capitalized by the act (1869) which disestablished the Irish Church. There is no endowment to other religious denominations, as in France; and the emoluments of the established church in England, though modified in their distribution by the labors of the Ecclesiastical Commissioners (q.v.), have not yet been appropriated to any other religious uses than these in connection with that church. The cause of established churches is very generally maintained on the ground of the alleged duty of the state to provide for the religious instruction of the whole body of the people, as most essential to their moral welfare and so to the general prosperity of the community. It is further argued in support of the same cause, that civil rulers, or the people as associated in a free state, are under a moral obligation of the highest kind, to acknowledge God, his law, and his ordinances. Concerning these and other arguments, for and against established churches, see the article VOLUNTARYISM. It may here, however, be observed, that the arguments just mentioned do not necessarily infer, even when admitted to the utmost, that the state is bound to support in any exclusive way a particular sect or denomination, unless, on the further assumption that religious truth and worth belong to that denomination alone. Nor does the *endowment* of a church by the state necessarily follow from the fullest adoption of the principles thus contended for. Yet, on the other hand, it is a point which may very reasonably be disputed, how far the common arguments against state endowments are applicable to those en-

dowments not originally bestowed by the state, but which the state has, from a very early period, recognized as belonging to the church.

ESTACADE, n. *ĕs'ta-kād* [F.]: in *fort.*, a line of stakes in water or swampy ground to check the approach of an enemy.

ESTAFET, or ESTAFETTE, n. *ĕs'tă-fĕt'* [F. *estafette*—from *stafetta*]: in *Europe*, one of a series of couriers in relay; an express for conveyance of letters and small packages.

ESTAING, *ĕs-tăng'*, CHARLES HECTOR, Comte D': 1729–1794, Apr. 28; b. Auvergne, France: army and navy officer. He entered the French army as col. of inf.; was promoted brig.gen. 1757; accompanied the expedition of Comte de Lally to the E. Indies; and was captured at the siege of Madras, 1759. He was released on parole, and without awaiting exchange, took command of several men-of-war and greatly harassed the English in various parts of the East. On his return to France, 1760, he accidentally fell into the hands of the English, and, being charged with breaking his parole, was imprisoned sometime in Portsmouth. In 1763 he was appointed lieut.gen., and 1777 vice-admiral in the French navy. In 1778, in accordance with the treaty between France and the United States, France fitted out a fleet of 12 ships of the line and 4 frigates to aid the latter in the struggle against Great Britain, and Estaing was placed in command. He sailed Apr. 13, reached Del. bay in July, and then proceeded to New York, expecting to encounter the British fleet on the way. He captured some prizes off the coast of N. J.; agreed to assist in a land and sea attack upon Newport to expel the British from R. I.; reached the harbor late in July; and hearing of the approach of a fleet put to sea to meet it. He was overtaken by a severe storm which caused him to put into Boston for repairs, and the projected attack failed. Subsequently he captured St. Vincent and Grenada, W. Indies; and 1779, Oct. 9, coöperated with Gen. Lincoln in an ineffectual attempt to capture Savannah, Ga. He returned to France 1780; commanded the allied fleets of France and Spain 1783; was elected to the assembly of nobles 1787; appointed to the command of the national guard 1789; chosen admiral of the navy 1792; testified in favor of Marie Antoinette at her trial 1793; and despite his eminent military and naval services to France was condemned as a royalist and guillotined.

ESTANCIA, n. *ĕs-tăn'sĭ-ā* [Sp. a mansion]: in *S. Amer.*, an estate; a farm.

ESTATE, n. *ĕs-tāt'* [F. *état;* OF. *estat*—from L. *status*, state, position]: condition of a person or thing; rank; landed property; property in general; orders or classes of men in a country; dominions or possessions: V. in *OE.*, to settle, as a fortune. ESTATES, n. plu. *ĕs-tāts'*, in *Scrip.*, persons of high rank; in *Scot. hist.*, the house of parlia-

ment. ESTATE-REAL, lands and tenements. -PERSONAL, movable property. -TAIL: see ENTAIL.—THREE ESTATES OF THE REALM, in *Britain*, the three branches of the legislature, the lords spiritual, the lords temporal, and the commons of Britain and Ireland (not, as popularly believed, the sovereign, lords, and commons): see STATES. FOURTH ESTATE, a name popularly and familiarly applied to the newspaper-press; journalists.

ESTATE, in Law: in its widest sense, property, both real and personal; but technically, the measure of a person's right to, or interest in, real property. The division of property into real and personal grew out of the nature of the remedies necessary to reinstate an owner who had been deprived of either, and may be traced to ideas borrowed from the Feudal law. Land itself is always viewed as real estate; but other things are classed among real or personal property, according to the intent with which they have been annexed to land and to a certain extent according to the manner in which the annexation has been made. Sometimes, however, by force of an equitable doctrine under which whatever is agreed to be done is regarded as done, things in no way physically attached to land may for the purpose of doing justice be regarded as land. A familiar instance of the application of this principle is the case of money directed by will or agreement to be laid out in land. Such money is considered land. And conversely, if land is directed to be converted into money, all the attributes of personal property may attach to such land. Estates may in the first instance be divided into legal and equitable. By the former is meant the estate which a person has at common law, by the latter an interest created by or enforceable in a court of equity: see EQUITABLE ESTATES: USES: TRUST. Legal estates may be considered with reference to the quantity of the estate, the time of enjoyment, and the number of persons who may unite in the enjoyment. Under the first division, estates are either freehold or less than freehold. Freehold estates, again are divided into freeholds of inheritance or fees (q.v.), and freeholds not of inheritance, or for life. An estate for life may be for the life of the person to whom it is granted, or for that of another person, or for more than one life. A person holding an estate for the life of another is called tenant *per antre vie*. An estate *per antre vie*, being a freehold, descends in case of the death of the tenant during the term to his heir, and not to his executor. See COURTESY, in Law: DOWER. Estates less than freehold are also called chattels real, and on the death of the tenant pass to his executor. They are divided into estates for years, estates at will, and estates on sufferance. See LEASE. With reference to the time of their enjoyment, estates may be divided into estates in possession or in expectancy. An estate in possession comprehends not only an estate in the actual occupation of the tenant but one from which he may have been wrongfully ousted. An estate in expectancy may be either in reversion or remainder: see REVERSION: REMAINDER. With reference to the number of persons entitled to the enjoyment, estates may be in severalty, in joint

tenancy, in coparcenary or in common. An estate in severalty, is where the sole right to the estate is in a single person. See JOINT TENANCY: COPARCENARY: TENANCY IN COMMON: also ESTOVER: EMBLEMENTS: WASTE; CHATTEL: RIGHT OF ENTRY.

ES'TÉ (ancient *Ateste*): town in the Italian province of Padua, on the s. slope of the Euganean Hills, 17 m. s.s.w. of Padua. It is an old town, and has a decidedly Lombard appearance, many of the houses being supported by arches. It has several interesting buildings, among which the chief are the *Rocca,* or castle of E., with a grim donjon tower, overhanging the town, and the church of *San Martino,* in Romanesque style, surmounted by a campanile, which slopes as much as the Leaning Tower of Pisa. Both church and tower have been sadly disfigured by an attempt to modernize them. E. manufactures silk goods, saltpetre, hats, and earthenware and has numerous silk-mills and whetstone quarries in the vicinity. Pop about 6,000.

ES'TÉ: one of the oldest and most illustrious families of Italy, which, according to the historian Muratori, owed its origin to those petty princes who governed Tuscany in the time of the Carlovingians, and who were in all probability of the race of the Longobards.—The first whose figure is more than a mere shadow is Adalbert (died about A.D. 917).—The grandson or grandnephew of Adalbert, named Oberto, was one of the Italian nobles who offered the crown of Italy to Otho of Saxony. He is afterward styled *Comes sacri palatii,* and appears to have been one of the greatest personages in the realm; he married a daughter of Otho, and died about 972.—In later times, the family of E. received from the emperors several districts and counties, to be held as fiefs of the empire. The family divided, at an early period, into two branches, the German and Italian. The former was founded by Welf or Guelfo IV., who received the investiture of the duchy of Bavaria from Emperor Henry IV. 1070. The houses of Brunswick and Hanover, and consequently the sovereigns of Great Britain, called also Este-Guelfs, are descended from this person. In the 12th, 13th, and 14th c., the history of the E. family, as heads of the Guelf party, is interwoven with the destinies of the other ruling families and small republics of n. Italy. During this period they gained possession first of Ferrara and the march of Ancona (1208), afterward of Modena and Reggio (1288–9), and were widely celebrated as the patrons of art and literature.—One of the most illustrious was Azzo VII., who encouraged Provençal troubadours to settle at his court at Ferrara, and founded schools in that city.—Alfonso I. (died 1534) was distinguished equally as soldier and statesman, and was celebrated by all the poets of his time, particularly by Ariosto. His second wife was the notorious Lucrezia Borgia. His quarrel with the Popes Julius II., Leo X., and Clement VII., was unfortunate, as an interdict was laid upon him for his adherence to the league of Cambray, and his papal fiefs declared forfeited. After the siege of Rome, 1527, the duke was restored to his former possessions by Charles V.—His suc-

cessor, Ercole or Hercules II., who married Renate, daughter of Louis XII. of France and Anne of Brittany, attached himself to Charles V. He and his brother, a dignitary of the Rom. Cath. Church, were also liberal patrons of art and science; the latter erected the magnificent Villa d'Este at Tivoli.—The next prince, Alfonso II. (died 1597), would have been not inferior to the preceding but for his immoderate love of splendor, his inordinate ambition, and his cruelty toward the poet, Tasso, whose eccentricities, however, it must be confessed, were enough to try the patience of any man.—Alfonso IV. (latter half of the 17th c.) was very fond of the fine arts, and founded the Este gallery of paintings.—Rinaldo (died 1737), by his marriage with the daughter of the Duke of Brunswick-Lunenburg, united the German and Italian houses, separated since 1070.—The male line of the house of Este became extinct on the death of Ercole III. 1803, his possessions having been previously seized by the French invaders, and annexed to the Cisalpine Republic. His only daughter married the Archduke Ferdinand, third son of Francis, emperor of Austria.—Their eldest son, Francis IV., by the treaty of 1814–15, was restored to the territories which had belonged to his maternal ancestors, comprising the duchy of Modena; and on his mother's death, obtained the duchies of Massa and Carrara.—He was succeeded by his son, Francis V., 1846, Jan. 21.—The connection which the family of Este, like others of the small Italian principalities, had formed with Austria, gave it pro-Austrian sympathies, the result of which has been fatal to its popularity and dynastic existence. In 1860, the sentiment of Italian unity and independence, which for the previous 15 or 20 years had been steadily fostered by the policy of Sardinia, triumphed in a universal explosion of national feeling, which united the peninsula (with the exception of Rome and Venice) under the authority of Victor Emmanuel. Venice was added to the kingdom of Italy 1866, and Rome became the capital 1870.

ESTEEM, v. *ĕs-tēm′* [F. *estimer*, to esteem—from L. *æstĭmō*, I set a price upon: It. *estimare*]: to set a high value upon; to prize; to regard with respect or friendship; to think; to hold in repute: N. a high value set upon; respectful or reverential regard; in *OE.*, estimate; reckoning. Esteem′ing, imp. Esteemed′, pp. *-tēmd′*. Esteem′able, a. *-ā-bl*, that can or may be esteemed. Estimable, a. *ĕs′tĭ-mă-bl* [F.—L.]: that can be estimated or valued; worthy of esteem or honor; deserving regard; valuable. Es′timably, ad. *-blĭ*. Es′timableness, n. *-bl-nĕs*.—Syn. of 'esteem, v.': to value; respect; revere; reverence; regard; estimate; appreciate; reckon.

ESTELLA, *ĕs-tĕl′yâ:* ancient city of Spain, province of Navarre, pleasantly situated on the left bank of the Ega, about 27 m. s.w. of Pamplona. It is a well-built, clean town, with several squares, and has, in the environs, a variety of agreeable promenades and pleasure-grounds. It

has two interesting churches, both old, and one of them, San Juan, a fine building with a very lofty tower. The manufactures are woolen and linen fabrics, brandy, and earthenware. A moderately good wine is made in the vicinity. Estella has some trade in fruits, wool, hardware, and grain. Here Don Carlos was proclaimed king 1833, Nov.; and at Estella, again become a Carlist stronghold, battles were fought 1874 and 5. The city was taken by the govt. troops 1876, Feb. Pop. abt. 7,000.

ESTERHAZY, Marie Charles Ferdinand Walsin: forger; b. 1847, Dec. 16; entered the French army; promoted lieut., 1878; capt., 1879, and com. (major in other armies), 1892; retired from army, 1897, owing to ill health. Became widely known in connection with trial of Capt. Alfred Dreyfus (q.v.), whom he accused as being writer of the *borderćau*, which it was alleged showed that Dreyfus had divulged French military secrets to German authorities. Col. Picquart, chief of Intelligence Bureau of War Office, made discoveries, 1896, which indicated that the *borderéau* was written by Esterhazy, who had forged Dreyfus's handwriting. On further investigation Dreyfus was given a new trial, and though again convicted, much evidence pointed to Esterhazy. So strong did this opinion become that Esterhazy was compelled to leave France.

ESTERIFICATION: in chemistry, the formation of an *ester* (q.v.), usually from an acid and an alcohol, as, for example, ethyl acetate, $H_3C\overset{=O}{C}{-}OCH_2CH_3$, the eythl ester of acetic acid, from acetic acid, $H_3C\overset{=O}{C}{-}HO$ and ethyl alcohol, CH_3CH_2OH, water is produced simultaneously.

ESTERS (an arbitrary modification of 'ether'): Compound Ethers, or Ethereal Salts, are compounds in which one or more alcohol or basic radicals are united to one or more acid radicals. They are analogous to the salts of the metals. Thus $CH_3COO.H$ is acetic acid, and if the typical hydrogen of this acid is replaced by the monad radical 'ethyl,' the resulting compound, $CH_3COO.C_2H_5$, is known as 'acetic ester,' Some of the esters are prepared by the direct action of the acid upon the alcohol. In other cases a mixture of the acid and the alcohol is distilled with the addition of sulphuric acid, zinc chloride, or other dehydrating agent. The esters may also be prepared by treating the iodide of the alcohol radical with the silver salt of the acid, the iodine and silver combining to form silver iodide, while the liberated alcoholic and acid radicals combine to produce the desired ester. The esters of the organic acids occur in fruits and flowers, and are also prepared artificially for flavoring purposes, and for improving the bouquet of wines. Much attention has been paid to the esters in connection with theoretical chemistry.

ESTHER, *ĕs'tĕr* (signifying 'the planet Venus'): is the Persian name of Hadassah, daughter of Abihail, the son of

Shimei, the son of Kish, a Benjamite. She is represented in Scripture as an orphan, and as having been brought up by her cousin Mordecai, officer in the household of the Persian monarch Ahasuerus. Her history, in the Book of Esther, is extremely interesting. When the misconduct of Vashti had cost her her 'royal estate,' all 'the fair young virgins' of the kingdom were gathered together, that Ahasuerus might choose a successor. He selected Hadassah, who received the name E for her loveliness. The great event of her life was the saving of her Jewish countrymen from the horrors of that universal massacre planned by the malice of Haman, and consented to by the thoughtless cruelty of an oriental despot. E.'s success was signal; and the feast which she and her cousin Mordecai appointed in memory of their deliverance—viz., the feast of Purim (i.e., of Lots), is, in consequence, celebrated to this day with great enthusiasm. E. is not mentioned in profane history, whence it has been inferred by some that she was not exactly the *wife* of Ahasuerus (Xerxes), but rather the favorite of his harem, to which she undoubtedly belonged; for, as we read (ii. 8), E. was consigned 'to the custody of Hegai, keeper of the women. This hypothesis perhaps gains probability from the fact, that the Persian kings did not choose wives from their harem, but from the principal Persian families, or from the daughters of foreign potentates.

ES'THER, Book of: one of the very latest of the canonical books of the Old Testament, and commonly, but without a shadow of evidence, supposed to be written by Mordecai or Ezra. This is the view of Abenesra, Clement of Alexandria, Augustine, Gerhard, and others. The Talmud assigns the authorship to the members of the Great Synagogue, a semi-mythical body, used by Jewish rabbis and Christians divines as a sort of *Deus ex machina* to solve every difficulty. According to the opinions of the most learned and unprejudiced critics the date of its composition must be placed after the downfall of the Persian monarchy. The language is much later than that of Ezra, and Nehemiah, and the fact of occasional explanation of Persian customs fits the period of the Seleucidæ better than an earlier one. The Hebrew text is that which has been followed in the English version; but the Septuagint is full of late interpolations and additions by Alexandrian Jews. The book is held in the highest reverence by the Jews; so much so, that Maimonides declared that, in the days of the Messiah, every Jewish scripture would be forgotten except the book of Esther and the Pentateuch. The book is not written in a theocratic spirit, like the rest of Jewish literature. Nothing is directly attributed to God; in fact, his name is not mentioned. Neither is there the remotest trace of religious feeling of any kind. Luther, in his usual off-hand way, expressed his contempt for the book, in spite of the admiration which the Jews bestowed on it, censuring it for its 'heathenish extravagance,' and declar that, in his judgment, it was 'more worthy than all of being excluded from the canon.' The absence of all recognition of God, perplexed some of the ancient Jewish

commentators, who therefore invented the hypothesis, that the book was originally a part of the Persian chronicles, probably executed by Mordecai. The hypothesis that it is a Persian chronicle, is by many late Christian scholars accepted as solving many difficulties. On this theory, this book has its place in the Bible by divinely inspired direction, as had the decrees of Nebuchadnezzar, Cyrus, and Darius. It is inserted as showing God's interposition by His providence to save the race of Israel from extinction, so that from it might come, according to the flesh, the promised Christ. The *Apocryphal additions* to Esther consist of six important passages, found neither in the Hebrew nor in the Chaldee, translated by Jerome into Latin, and printed in later editions of the Vulgate without his explanations. In the later form they are found in the English versions of the Apocrypha.

ESTHERIA, n. *ĕs-thēr'ĭ-a* [an anagram for *Theresia*]: genus of crustaceans, order *Phyllopoda*, family *Limnadiadæ*. The body is protected by a bivalve carapace, with concentric lines of growth, the two bivalves of which are united at their beaks, though they have not a ligament. Twenty-four species have been discovered, all inhabitants of fresh or of brackish water, not one marine. Till 1856, the carapace of Estheria found in the Old Red Sandstone of Scotland was believed to be the bivalve shell of a small marine mollusk *Posidonomya minuta*. The discovery was made in that year that it was probably crustaceous and from fresh or brackish water.

ESTHESIOMETER, or AESTHESIOMETER, n. *ĕs-thē-sĭ-ŏm'ĕ-tėr* [Gr. *aisthēsis*, perception, sensibility; *metron*, a measure]: in *surg.*, an instrument to ascertain the tactile sensibility of the human body. It has two points, adjustable as to distance, and the object is to ascertain the greatest proximity at which the points give distinct sensations. The result is indicative of the normal or abnormal condition of the tactile sensibility of the skin. The discriminative sensibility of the skin varies markedly for different parts of the body. The instrument is used in experimental psychology to investigate various problems of tactual space perception.

ESTHETICS. See ÆSTHETICS.

ESTHONIA, *ĕs-thō'nĭ-â*, called by the inhabitants *Wiroma* (i.e., the Border-land). Russian government, one of the Baltic Provinces (q.v.). It extends immediately s. of the Gulf of Finland; 7,787 sq. m. It was conquered (1182–1241) by the Danes, who sold it to the Teutonic knights 1346. It came into the possession of the Swedes 1561, but was taken from them by Peter the Great 1710; and by the treaty of Nystadt was finally secured to Russia 1721. One-third of the entire surface, which is in general flat, is under cultivation, and produces great quantities of rye and barley; the remaining two-thirds are chiefly sandy tracts and marshes, strewn in many places with large blocks of granite; there are also extensive forests of birch and

pine. The govt. of Esthonia is divided into four circles; its principal town is Reval or Revel (q.v.).

The inhabitants are divided into Esthlanders and Esths. The former are a mixture of Swedes, Germans, and Russians, and comprise the nobles and the town-populations. The latter belong to the Finnish race, and are the original possessors of the soil. Their language is soft and musical, and is divided into two leading dialects, that of Revel and that of Dorpat. They possess a literature rich in splendid national songs. See Neus, *Esthnische Volkslieder* (Reval, 1850–1). They are industrious, kind-hearted, and in the main religious and attached to the Prot. doctrines. A great part of Livonia is peopled with Esths, the entire number of whom in all the Baltic provinces is about 650,000. Pop. 413,724.

ESTHS, n. plu. *ĕsts*, or ESTHONIANS, n. plu. *ĕs-thō′nĭ--ănz:* a people s. of the Gulf of Finland, allied to the Finns: see ESTHONIA.

ESTIENNE, or ETIENNE: see STEPHENS (family of printers).

ESTIMATE, v. *ĕs′tĭ-māt* [L. *æstĭmātus*, valued, rated (see ESTEEM)]: to form an opinion of the value of or expense of; to fix the value by comparison and from experience; to calculate: N. the computed cost of anything; a valuing or rating by the mind; a valuation. ES′TIMATING, imp. ES′TIMATED, pp. ES′TIMATOR, n. *-tėr*, one who. ES′TIMA′TION, n. *-mā′shŭn* [F.—L.]: an opinion or judgment of the value or worth of; esteem; regard; favorable opinion. ES′TIMATIVE, a. *-mā-tĭv*, able to estimate or judge.—SYN. of 'estimate, v.': to appraise; value; appreciate; prize; rate; number; count; esteem; judge; compute; regard; honor.

ESTIVATION, ESTIVAL: see ÆSTIVATION.

ESTOC, *ās-tok′* [Italian]: small dagger worn at the girdle, called in Elizabethan times a tucke.

ESTOILE, *ās-toyl′*, or STAR, in Heraldry: charge differing from the mullet (q.v.) by having six waved points; the mullet consisting of five plain points: see MULLET.

ESTO PERPETUUM, *ĕs′tō pėr-pĕt′ū-ŭm*, or ESTO PERPET′UA, *-pĕt′ū-a* [L.]: may or let it be perpetual or forever.

ESTOPPEL, n. *ĕs-tŏp′ĕl* [OF. *estouper*, to stop]: in *law*, impediment, or bar to a right of action, arising from a man's own act. It is called an estoppel or conclusion, because a man's own act or acceptance stoppeth or closeth up his mouth to allege or plead the truth.—*Co. Litt.* 352 a. Estoppels are of three kinds (1). By matter of record, where any judgment has been given in a court of record, the parties to the suit are estopped from afterward alleging such matters as would be contradictory to the record. (2) By matter in writing. Thus, a party who has executed a deed is precluded from afterward denying, in any action brought upon that instrument, the fact of which it is evidence. (3) By matter in *pays*, as by livery, by entry,

by acceptance of rent, etc.—by any of which acts a man is barred from pleading anything to the contrary. The principle of estoppel is that what a man has once solemnly alleged is to be presumed to be true, and therefore he should not be suffered to contradict. The doctrine of estoppel prevails in the United States and England; also in Scotland, under the name of personal exception (q.v.). ESTOP, v. *ĕs-tŏp′*, to bar; to place under estoppel. ESTOP′PING, imp. ESTOPPED, pp. *ĕs-tŏpt′*.

ESTOUFADE, n. *ĕs-tô-fâd* [F. *étouffade*—from OF. *estouffer;* F. *étouffer*, to stuff]: in *cook.*, a mode of cooking meat slowly in a closed vessel.

ESTOVER, n. *ĕs-tō′vėr* [OF. *estoveir*, to be needful]: in *law*, supply of needful wood for repairs, fuel, etc.; an incident to the estate of a tenant for life or for years. It is the right which the tenant has to make use of the wood on the estate for certain definite purposes. Estovers, or *botes* (Saxon), are of three kinds—house-bote, which is twofold—viz., *estoverium ædificandi et ardendi*, a right to wood for fuel and repairs of the house, plowbote, *estoverium arandi*, wood for plows and carts; and haybote, *estoverium claudendi*, wood for repairing hedges and fences. —*Co. Litt.* 41 b. Estover is used sometimes also to denote an allowance of food and clothes.

ESTRADE, n. *ĕs-trād′* [F.]: a level place; the raised part of the floor of a room.

ESTRANGE, v. *ĕs-trānj′* [F. *étranger*, a foreigner: OF. *estrange*, strange—from It. *estraneo*, not native, foreign—from L. *extrānĕŭs*, what is without, a stranger]: to divert from its original use; to alienate; to turn from kindness to indifference or enmity; to withdraw the heart or affections from. ESTRAN′GING, imp. ESTRANGED′, pp. *-strānjd′*. ESTRANGE′MENT, n. *-mĕnt*, the withdrawal of the heart or affections from; alienation.

ESTRANGELO, n. *ĕs-trăng′gĕl-ō* [*e*, not: Gr. *stronggulos*, smooth or even]: a variety of the old Phœnician alphabet, whose characters are heavy and cumbrous; said also to be derived from two Arabic words, signifying 'writing of the Gospel.'

ESTRAPADE, n. *ĕs′tră-pād′* [F. a species of torture]: the violent jerking of the hind legs which a horse makes when desirous of getting rid of his rider; also STRAPPADO, n. *străp-pā′dō*.

ESTRAY, v. *ĕs-trā′* [OF. *estrayer*, to stray]: in *OE.*, to stray. ESTRAYS′, n. plu. *-trăz′*, in *law*, valuable animals, whose owner is not known, found wandering. The law of estray varies in different states; usually cattle at large or doing damage in fields, etc., can be sent to a public pound, and if unclaimed after a fixed time, can be sold for damages and expenses, the remainder, if any, going to the town-treasury. In some states they are advertised instead of impounded.

ESTREAT, n. *ĕs-trēt′* [Norm. F. *estraite*—from L. *ex-*

tractum, copy of any original writing; *tractus*, drawn]: true extract copy of any original writing, especially of fines set down in the rolls of a court to be levied of any man for his offenses: see RECOGNIZANCE: V. to copy; to levy fines, etc., under an *estreat*. ESTREAT'ING, imp. ESTREAT'ED, pp. applied to the recognizances when the officer is directed to take out such a copy for the purpose of levying the amount.

ESTREEN, n. *ĕs-trēn'*: SCOTCH for YESTREEN, which see.

ESTRÉMADURA, *ĕs-trā-mâ-dô'râ:* next to Alemtejo, the largest province of Portugal; 6,907 sq. m. The greater part of the country is hilly, but the hills do not attain great elevation. West of the estuary of the Tagus are the granite mountains of the Serra da Cintra, 1,500 to 1,800 ft. in height, terminating in the Cabo de Roca. South of the Tagus are barren moors, partly broken by morasses, and the limestone chain of Arrabida, rising to a height of 1,000 ft., and terminating in the Cabo de Espichel. Many districts are extremely fertile, others barren and uncultivated. The Tagus, which is navigable only as far as Abrantes, receives the waters of the Zezeres, the Sorraya, and the Canha, and is strewn with islands at its mouth. The chief productions of the country are wine, oil, fruits, corn, and cork; but even the sandy plains are covered with cistus, rosemary, myrtles, and other flowering and fragrant plants. The breeding of cattle is not much attended to. The minerals are marble, coal, and sea-salt. This province has been frequently visited by earthquakes. Pop. including the cap., Lisbon, 1,232,593.

ESTREMADURA: previous to the new distribution of the country, a province of Spain; between Portugal and New Castile, watered by the Tagus and the Guadiana. It is bounded on the n. by Leon, on the s. by Andalusia, and, since 1833, has been divided into the two provinces of Badajos and Caceres; area 16,554 sq. m. Although a continuation of the high table-land of New Castile Estremadura is not, like it, a uniform plain, but is mountainous on the n. and s., and is well watered, the slopes of the hills being covered with wood, and the valleys with rich grass. Notwithstanding the fertility of the soil, the land has lain desolate and uncultivated ever since the expulsion of the Moors in the 13th c. This is chiefly to be attributed to the Mesta, or right of pasture, which causes the land to be regarded as the common property of the possessors of flocks. The breeding of goats, swine, horses, asses, and mules is much attended to. Silk and honey form considerable branches of trade. Grain is still imported. The mines, formerly very productive, are no longer wrought. Commerce is confined almost entirely to a contraband trade with Portugal. The inhabitants are poor, and, from the want of roads, isolated from the rest of Spain, and consequently in a low state of civilization. They make excellent soldiers, however, and have produced a series of brave *conquistadores* and generals. Pop. 882,410.

ESTREMOZ, *ĕs-trā-mŏz′:* fortified town of Portugal, province of Alemtejo, 23 m. n.e. of Evora, and about the same distance e. of Elvas. It is built round the base of the hill on which its once formidable castle, erected 1360, is placed. It now ranks as the fourth or fifth stronghold in Portugal. Estremoz is famous for manufactures of earthenware; its jars, of a porous clay, with the property of keeping water singularly cool, are of elegant shape, and are used all over the peninsula. The earthenware manufactures of Estremoz seem to have continued unchanged since Roman times, as until the present day the forms into which the jars are cast are purely classical. In the neighborhood of Estremoz is a marble quarry. Pop. about 8,000.

ESTRIDGE, n. *ĕs′trĭj*, or ESTRICH, n. *ĕs′trĭch:* in *OE.*, an ostrich.

ESTUARY, n. *ĕs′tū-ă-rĭ* [L. *æstŭārĭŭm*, an arm of the sea—from *æstŭārĕ*, to rage or boil, as the sea—from *æstus*, heat; surge: F. *estuaire;* It. *estuario*]: the mouth of a tidal river; an arm of the sea; a frith. ESTUARINE, a. *ĕs-tū′ă-rĭn*, or *ĕs′-*, of or pertaining to an estuary; formed in an estuary.

ESURIENT, a. *ĕs-ū′rĭ-ĕnt* [L. *esŭrĭĕn′tem*, desiring to eat, suffering hunger]: desirous to eat; hungry: N. one who is hungry; a greedy or avaricious man.

ESZEK, *ĕs′sĕk:* royal free town of Slavonia, on the right bank of the Drave, 12 m. above its confluence with the Danube, is the administrative cap. of the 'Kingdom,' and the most prosperous trading-town of Slavonia. Since the Drave began to be navigated downward to Eszek by steamers, the town has had prosperous trade in corn, wood, pigs, iron, deals, wine, and flax. The fortress of Eszek, known in Roman times under the name of Mursia, is protected by a fort on the left bank of the Drave. In the fortress, the commander's dwelling and the town-house, and in the lower town the county buildings, are specially noticeable. During the Hungarian revolution, the town was at first held by Count Casimir Batthyányi, but capitulated, after a siege of several weeks, to the Austrian general. More than half the inhabitants are Rom. Catholics, the rest being Greek Catholics, Protestants, and Jews.—*Eszeg* is the Hungarian spelling of the Slavonian name *Essek*. Pop. about 20,000.

ESZTERHAZY: see ESTERHAZY.

ETACISM, n. *ā′ta-sĭzm* [F. *étacisme*]: in *philol.*, the method of pronouncing Greek in which the letter η, *eta*, has the sounds of *a* in *fate*. In modern Greek this letter has the sound of *ee* in *fleet*. E′TACIST, n. *-sĭst* [F. *étaciste*]: one who practices or defends etacism.

ETÆREIO, n. *ĕ-tē′rĭ-ŏ* [Gr. *etairĭă*, fellowship, society]: in *bot.*, a fruit composed of several distinct one-seeded fruits or drupes, arranged upon an elevated receptacle or torus, as in the mulberry.

ÉTAGÈRE, n. *ā-tâ-zhär* [F.—from *étager*, to raise by stages or stories; *étage*, a stage, a story]: a set of shelves in the form of an ornamental standing-piece of furniture, used for the display of articles of vertu.

ETAH, *ē′tâ:* district of British India, in the division of Agra; between lat. 27° 20′ 30″ and 28° 1′ n., and long. 78° 29′ and 79° 20′ e.; 1,512 sq. m. It is elevated alluvial plateau, with more than half its area under cultivation, and yields two harvests a year of wheat, barley, pulse, millet, cotton, sugar-cane, indigo, and opium. The Ganges river is the principal means of transportation. Etah has 8 towns with pop. exceeding 5,000, and 5 municipalities. It was the seat of a primitive Arvan civilization, rich in temples and monasteries. Pop. nearly 800,000.

ÉTAMPES, *ā-tŏngp′* (anc. *Stampæ*): town of France, dept. of Seine-et-Oise, 32 m. s.s.w. of Paris, on the Orleans railway. It consists mainly of one street, about four m. long. The chief buildings are the ecclesiastical edifices. E. has a public granary, capable of containing 1,400 tons of wheat. In and around E. are more than 40 flour-mills, constantly employed in providing for the Paris market; considerable quantities of garden-stuff are sent from this neighborhood to the capital. Pop. 8,000.

ÉTANG DE BERRE, *ā-tŏng′dĕh bär:* salt-lake of France, in the s. of the dept. of Bouches-du-Rhone, 11 m. long and 9 wide (at widest part), communicating with the sea by a narrow channel, called Tour-le-Bouc. This lake contains great quantities of eels and other fish. Salt-works are on its banks.

ETANIN, n. *ĕt′a-nĭn* [corrupted Arab]: in *astron.*, a fixed star of the second magnitude, called also γ Draconis. By it Bradley discovered the aberration of the fixed stars.

ÉTAT-MAJOR, n. *ā-tâ-mâ-zhawr′* [F.]: in *mil.*, the staff of an army or regiment. It includes all officers above the rank of colonel; all adjutants, quarter-masters, inspectors, engineers, commissaries, ordnance officers, pay-masters, surgeons, judge-advocates, and their non-commissioned assistants. In the department of military map-making, the English Ordnance Office corresponds in some respects with the French état-major.

ETAWAH, *ĕt-â′wâ*, or ITAWA *ĭt-â′wâ:* district of which the town of Etawah is cap.; the lieut.-governorship of the N. W. Provinces. It lies entirely in the basin of the Jumna, and almost exclusively within the Doab, stretching in n. lat. 26° 21′ to 27° 9′, and in e. long. 78° 46′ to 79° 49′; 1,694 sq. m. The district was at one time famous for the murderous fanaticism of the Thugs, 67 corpses of their strangled victims having been found in the wells during a single year. Pop. about 750,000.

ETAWAH: town of the Doab, near the left bank of the Jumna, about 70 m. below Agra, lat. 26° 46′ n., and long. 79° 4′ e. Though it is, on the whole, a dreary and mean

place, yet it presents some remains of ancient grandeur, particularly many of those ghats or flights of stairs which facilitate the approach to the river for ritual ablution. Its prosperity, such as it is, is due chiefly to its position at the junction of the two roads which lead to Agra from Cawnpore and Calpee. Pop. about 35,000.

ET-CETERA, or -CÆTERA, *ĕt-sĕt′ĕ-ră* [L. *et*, and; *cætĕră*, other things]: commonly contracted into &c. or etc.—put at the end of a sentence, title, or announcement, to point out the fact that *other things* could be mentioned, or are to be understood as following; and so on. ET CÆTERA OATH, n. an oath imposed on the clergy by the Anglican bishops 1640, 'binding them to attempt no alteration in the government of the church by bishops, deans, archdeacons, etc.'

ETCH, v. *ĕch* [Dut. *etsen*, to etch—from Ger. *atzen*, to cause to eat]: to engrave a metal plate by the eating or corroding power of an acid. ETCH′ING, imp.: N. the art of producing a picture on a metal plate by the eating power of an acid; the impression from the plate. ETCHED, pp. *ĕcht*. ETCH′ER, n. one who. ETCHING-GROUND, the substance, usually a mixture of wax and resin, used to protect the surface of the metal, etc., from the action of the acid. ETCH′INGS, n. plu. impressions upon paper of designs etched on a plate of copper, steel, etc.: see HATCH, and note: also ENGRAVING.—ETCHING ON GLASS: see GLASS.

ETCHEMINS, *ĕt′chė-mĭnz:* ancient tribe of American Indians, supposed to have belonged to the Abenaqui nation and to have lived along the St. Croix river. They are now represented by the Penobscot and Passamaquoddy families, who occupy extensive reservations in the eastern part of Maine, adhere to the Rom. Cath. Church, and have schools and churches of their own. The families are about equally divided and aggregate 1,000.

ETCHMIADZIN, *ĕtch-mē-âd-zēn′*, or ECHMIEDZIN, or EDCHMIADZIN, or ITSMIADZIN: town and monastery of Russia, govt. of Erivan; in the plain of the Araxes river, 12 m. w. of Erivan, 30 m. n. of Mount Ararat; elevation above sea level 2,985 ft.; seat of the Catholicos or primate of the Armenian Church. The monastery has the appearance of a strong fortification, and consists of a number of buildings, surrounded by brick walls 30 ft. high, provided with loop holes and towers. The cluster forms a quadrangle, on the w. side of which is the residence of the Catholicos, on the s. the refectory, on the e. the monks' lodgings, and on the n. the cells. There is a small cruciform cathedral, with two towers, a remarkable porch of red porphyry, and very rich interior decorations, where the Catholicos confers episc. consecration, and, once every 7 years, prepares the holy oil for use in all Armenian churches. The cathedral is said to number among its sacred relics the head of the spear which pierced the Savior's side, a piece of Noah's ark, and a piece of the true cross. Outside the main entrance are alabaster tombs of the Catholici Alexander I., Alexander II., Daniel, and Narses.

and a marble monument over the grave of Sir John Macdonald, who died 1830 while on a mission to the Persian court. About half a mile from the cathedral are two churches, memorials to St. Rhipsime and St. Gaiana, early martyrs of Armenian Christianity, the latter being used for the burial place of all primates not pronounced by the synod worthy of interment beside the cathedral. Connected with the monastery is a library, said to have contained at one time 15,000 vols., but now reduced to about 2,500. These, however, furnish a rich storehouse of Armenian literature, and include MS. copies of the Gospels in carved ivory binding of the 10th or 11th c., and Bibles of the 13th c. A complete printing establishment, with typefoundry, presses, and book-binding requisites, is maintained by the monks, who publish a weekly newspaper, *The Ararat*, and various religious and educational works. A modern college and seminary stands e. of the monastery. The monastery is supported by an average annual revenue of $50,000, derived from the conventual domains, which include a number of estates and 5 Russian villages. In 1872 the inmates numbered 5 bps. and abps., 20 monks, and 25 novices, and the pop. of the town was abt. 8,000. The monastery was founded by Narses II. who ruled 524-33, and since 1441 Etchmiadzin has been the centre of the Armenian Church.

ETERNAL, a. *ē-tėr′năl* [F. *éternel*, eternal, perpetual—from L. *æternālis*—from *æternus*, perpetual—from *ævum*, an age; akin to Skr. *âjus*, life: It. *eternale*]: without beginning or end of existence; without an end; everlasting; existing always without change: N. a title of Deity. ETER′NALIST, n. *-năl-ĭst*, one who holds the existence of the world to be eternal. ETER′NALLY, ad. *-lĭ*. ETER′NITY, n. *-nĭ-tĭ*, duration without beginning or end; endless future existence. ETER′NIZE, v. *-nēz*, to make endless; to immortalize. E′TERNI′ZING, imp. ETER′NIZED, pp. *-nīzd*. ETERNAL CITY, Rome, capital of Italy. ETERNAL PUNISHMENT: see HELL: IMMORTALITY. *Note.*—In popular usage, *eternal* and *everlasting* are very much used as synonymous. In the original Biblical use of the terms, however, *eternal* has for its primary significance, 'beyond all conditions of time.'—SYN. of 'eternal': endless; infinite; ceaseless; interminable: perpetual.

ETESIAN a. *ē-tē′zhĭ-ăn* [Gr. *etesĭŏs;* L. *etesĭus*, annual —from Gr. *ĕtŏs*, a year: F. *étésien*]: periodical; denoting a northerly or north-easterly wind that prevails all over Europe in early spring; in *Gr.* and *Rom. authors*, applied to the periodical winds in the Mediterranean, from whatever quarter they blow.

ETHANE, n. *ē′thān* [Eng. *ether;* termination used to denote that the hydrocarbon belongs to the series, C_nH_{2n+2}]: chemical formula C_2H_6: a gaseous hydrocarbon belonging to the paraffin series and constituting its second member (the first being methane, or marsh-gas). It occurs in the gases that are given off by crude petroleum;

and it may be prepared by heating methyl iodide with metallic zinc in closed tubes at 300° F.; also by the electrolysis of a concentrated solution of sodium acetate. It is a colorless gas, which burns with a pale flame, and combines with water, under pressure, to form a crystalline hydrate.

ETHELBERT, *ĕth′ĕl-bėrt,* King of Kent: abt. 552-616 (reigned abt. 560-616); fourth in direct descent from the great Hengist. He succeeded to the throne in about the eighth year of his age. The representative of the first Saxon king who ruled in England, and envious on that account of the title of Bretwalda, then held by Cealwin of Wessex, Ethelbert rashly undertook an expedition against that king in 568, a venture which, had he known the extent of country covered by the West Saxons, he would probably never have made. The rival kings met at Wibbandune, now Wimbledon, in Surrey, where a great battle took place, resulting in the defeat of Ethelbert. This is recorded as the first battle that ever occurred between Anglo-Saxon sovereigns. Taught by disaster and danger, Ethelbert became more prudent. His subsequent schemes were more successful, and, about 590, he was acknowledged as Bretwalda of the Saxon octarchy, a dignity which he maintained to the close of his reign and life. In 570, Ethelbert married Bertha, a Frankish princess. The lady was a Christian, and it is said had stipulated, as a condition of her marriage, that she should be allowed, after her arrival in Kent, to practice her own religion. Her amiable piety had completely disarmed Ethelbert of all violence against the Christian religion long before the most important event of his life took place, viz., the formal introduction of Christianity into his kingdom. This was effected by the ministrations of St. Augustine, who was sent to Britain by Pope Gregory, and who landed in Kent 596. In the following year the king himself was converted, and Christianity established among the hitherto pagan Saxons. After his conversion and baptism, he founded the bishopric of Rochester, and, in concert with his nephew Sebert, King of Essex—who also had been converted—erected the church of St. Paul's in London. Ethelbert is distinguished as the author of the first written Saxon laws. These are the *Dooms*, as they are called by Bede, 'which he established with the consent of his Witan in the days of St. Augustine.' They are in the Saxon language, and are the earliest written laws extant in any modern tongue.

ETHELREDA, *ĕth-ĕl-rē′da,* Saint: daughter of the king of the East Angles, in the 7th c.; canonized for her saintly virtues, and whose festival in the calendar is Oct. 17. Her name was popularly abbreviated or corrupted into St. Audrey. At a fair in the Isle of Ely, called after her St. Audrey's fair, it was customary to sell a common kind of lace, which came to be known as St. Audrey's lace. *Tawdry,* as applied to any inferior, and showy material, is believed to be a corrupt use of the term St. Audrey.

ETHENE, n. *ē′thēn* [adapted from *ether*]: heavy carburetted hydrogen or olefiant gas; also called *ethylene.*

ETHENYL, n. *ĕth′ĕn-ĭl* [Eng. *ethene;* Gr. *hulē,* matter]: trivalent radicle $H_3CC\equiv$, derived from ethane, CH_3CH_3, by removal of three atoms of hydrogen. The isomeric monovalent radicle, $H_2C{:}\acute{C}H$, is termed 'vinyl.'

ETHER, n. *ē′thėr* [F. *éther*—from L. *æther;* Gr. *aithēr,* the upper or pure air: It. *etere*]: an extremely fine fluid, supposed to fill all space beyond the limits of our atmosphere (see ETHER, or ÆTHER); a very light, volatile, and inflammable liquid, obtained from alcohol and an acid by distillation; the oxide of an acid radical. ETHE′REAL, a. *-thē′rĭ-ăl,* heavenly; spiritual; celestial; resembling ether. ETHE′REALLY, ad. *-lĭ.* ETHE′REAL′ITY, n. *-ăl′ĭ-tĭ.* ETHERIZE, v. *ē′thėr-īz,* to convert into ether; to stupefy with ether; to make spiritual. ETHE′REALIZE, v. *-ăl-īz.* ETHE′REALIZING, imp. ETHE′REALIZED, pp. *-īzd.* ETHERIFICATION, n. *ē-thėr′ĭ-fĭ-kā′shŭn* [L. *facĭō,* I make]: the act of making ether from alcohol. ETHERIFORM, n. *ē-thėr′ĭ-fawrm* [L. *forma,* shape]: having the form of ether. ETHERINE, n. *ē′thėr-ĭn,* substance combined with etherol to form a light oily liquid that rises to the surface when heavy oil of wine is warmed with water. E′THERISM, n. *-ĭzm* [Eng. *ether;* F. *éthérisme*]: in *med.,* effects produced on the human frame by the administration of ether. ETHERIZA′TION, n. *-ī-zā′-shŭn* [F. *éthérisation*]: in *chem.,* process of manufacturing ether; in *med.,* art or act of administering ether to a patient; the state of the human frame under the influence of ether.

ETHER (otherwise called ETHYLIC ETHER, or VINIC ETHER, or SULPHURIC ETHER). extremely volatile liquid, prepared from alcohol by the action of sulphuric acid at an elevated temperature. On the small scale, the apparatus which may be employed for the purpose is the retort and receiver, into which a mixture of equal weights of spirits of wine, or rectified spirit and oil of vitriol, or, by volume, 2 of alcohol and 1 of sulphuric acid, are placed, and heat being cautiously applied, a liquid distils over, which consists of ether and water. In a short time, the contents of the retort begin to blacken, and the operation must be stopped, or the distillate will become contaminated with sulphurous acid. On the large scale, a modification of the process is carried on, which renders it theoretically a 'continuous process,' though, practically, there is a limit to the amount of ether distilled over.

The conversion of alcohol (C_4H_5O,HO) into ether (C_4H_5O) and water (HO) by oil of vitriol ($HOSO_3$), was at one time considered to be due simply to the strong affinity of the oil of vitriol for water, which enabled it to take possession of the one atom of water, the elements of which form the only difference in the ultimate composition of alcohol and ether. This simple mode of explaining the process of etherification, however, does not acknowledge that the atom of water is not retained by the oil of vitriol, but is given off side by side with the ether in mechanical

solution therewith. The theory of the process now generally accepted is too complex for introduction here.

Ether is a colorless, transparent, volatile liquid of great mobility and high refractive power with a fragrant odor, and a fiery, passing to a cooling, taste. When pure, it has the specific gravity 720 (water = 1000) at 60° F., though the commercial specimens are never free from water and alcohol, and have the density 740. It boils at 94.8° F. (the commercial at 96°), and yields a very dense vapor, the specific gravity of which is 2,586, as compared with air 1,000. When reduced to a temperature of —24° F., ether freezes. It volatilizes spontaneously when unconfined, as in the palm of the hand, and vaporizes so quickly as to produce intense cold. Indeed, when water is covered with ether, and the latter assisted in its evaporation by being blown upon, it escapes so readily as to reduce the temperature of the water to 32° F., when it freezes. It is very inflammable, burning with a yellow-white flame; and mixed with air or oxygen, it gives rise to a dangerous explosive mixture, and hence great care requires to be taken in its distillation to keep all lights and fires out of the room where the vapors are condensing. When ether is added to its own bulk of water, briskly agitated, and allowed to settle, the two liquids appear to separate again; but it is found that the ether has taken up one-eighth of its volume of the water, while the latter has dissolved the same quantity of ether. It is readily miscible with alcohol in all proportions. Ether is one of the best solvents for the oils and fats, and hence is employed in analysis for the solution and separation of the oils from other organic matters, as in the analysis of oil-cakes, etc. It is also a good solvent of iodine, sulphur, phosphorus, and of strychnine, and other alkaloids, as well as corrosive sublimate, etc.

Ether is useful in the preparation of freezing mixtures, and the mixture of ether and solid carbonic acid gives the lowest temperature as yet attained. When inhaled by man and the lower animals, ether first produces stimulating and intoxicating effects, but afterward it gives rise to drowsiness, accompanied by complete insensibility, which entitles ether to be regarded as an important anæsthetic agent; and, indeed, for sometime it was the only agent used for producing anæsthesia (q.v.) in surgical operations, but has been entirely superseded by the employment of chloroform.

Ether enters into combination with many acids, forming compound ethers, possessing great fragrancy; the more important of these are the following:

Acetic Ether,	$C_4H_5O,C_4H_3O_3$.	
Butyric Ether,	C_4H_5O,C_8H_7O,	Pine-apple Oil.
Caproic Ether,	$C_4H_5O,C_{12}H_{11}O_3$	Essence of Melons.
Rutic Ether,	$C_4H_5O,C_{20}H_{18}O_3$	
Pelargonic Ether,	$C_4H_5O,C_{18}H_{17}O_3$,	Essence of Quinces.
Œnanthic Ether,	$C_4H_5O,C_{14}H_{13}O_2$,	Wine Oil.

There are other ethers, in which ordinary ether is not one of the members, as

Amyl Acetic Ether,	$C_{10}H_{11}O,C_4H_3O_3$,	Jargonelle Pear Oil.
Amyl Valerianic Ether,	$C_{10}H_{11}O,C_{10}H_9O_3$,	Appl Oil.
Methyl Salicylic Ether,	$C_4H_5O,C_{14}H_5O_5$,	Oil of Winter Greens.

E′THER, sometimes *Æ′*THER: the medium assumed in astronomy and physics as filling all space. It was shown by Newton, that if light consisted of material particles projected from luminous bodies, these must move *faster* in solids and liquids than in the air, in order that the laws of refraction might be satisfied in their motions. Huyghens, on the other hand, showed that to account for the same laws on the supposition that light consisted in the undulatory motions of an elastic medium, it must move more *slowly* in solids and fluids than in gases. Fizeau and Foucault have lately, by different methods, measured these velocities relatively, and have found Huyghens's prediction correct. Light, then, in the theory now accepted, consists in the vibratory motion of a medium, which must, of course, fill all space. This is called Ether. As yet, we have no idea as to its ultimate nature; some of our greatest philosophers even, have supposed that it may be of the class of ordinary gases, and that our atmosphere, for instance, is not finite in extent, but pervades, with greatly reduced density, all interplanetary and interstellar space. Many objections, however, may easily be raised against this supposition. Meanwhile, the mathematical theory of light, on the hypothesis of undulations, requires that the vibrating medium should possess properties more nearly allied to those of an elastic *solid* than those of a liquid or a gas. The ether being *required* theoretically for explanation of the existence and the propagation of light, it becomes a matter of importance to inquire how many more of the physical forces may be referred to the same cause or medium. Radiant heat certainly may, and probably, gravitation, molecular actions, magnetic, electric, and electro-dynamic attractions and repulsions, also are to be thus explained. As to sensible and latent heat, electricity and magnetism themselves, the necessity is not so clear; but even these have been of late *almost* satisfactorily explained by the hypothesis of the all-pervading ether: see FORCE: also see the same in reference to the impossibility of the ether's consisting of air or other gases, which are made up of distinct and separated particles.

ETHERIA, or *Æ*THERIA, n. *ē-thēr′ĭ-a* [L. *ætherius;* Gr. *aitherios,* belonging to the ether or upper air]: in *zool.*, genus of mollusks, family *Unionidæ.* Known species four, from the Nile and the Senegal rivers. According to M. Calliard, the natives of the upper parts of the Nile valley use the shells in astonishing numbers to ornament their tombs.

ETHERIFICATION: in chemistry, the formation of an ether, i. e., of an organic compound consisting of two hydrocarbon radicles (q.v.) united by means of an oxygen atom, such as ordinary ether (diethyl ether) $CH_3CH_2OCH_2$-CH_3 (q.v.).

ETHEROGRAPHY, n. *ĕ′thėr-ŏg′ră-fĭ* [Gr. *aither,* the upper or pure air; *graphō,* I write]: a description of the atmosphere, its nature, uses, and phenomena; aerology.

ETHEROL, n. *ē'thėr-ŏl* [Eng. *ether;* L. *oleum,* oil]: in *chem.,* a yellowish viscid liquor obtained from heavy oil of wine. Sp. gr. 0·921; boils at 280°.

ETHERSPHERE, n. *ē'thėr-sfēr:* in *physics,* term introduced by the Rev. S. Earnshaw to illustrate an hypothesis of his. He considers that all space not filled by matter is filled by ether. If from any cause a portion of space be rendered void of this subtle existence, the medium outside the space will press it into smaller compass, and, if there be in it an atom of matter, the ether around it will become more dense under the influence of the pressure. The ethersphere is then the excess of ether about the vacant space above its original amount or quantity.

ETHICAL MOVEMENT AND ETHICAL SOCIETIES IN AMERICA AND ABROAD. The first Ethical Society was established and the Ethical Movement inaugurated in 1876 in New York by Dr. Felix Adler, then a lecturer at Cornell University. In his opening address Dr. Adler appealed to his auditors to unfurl a new flag of peace and conciliation over the bloody battlegrounds where religions had fought in the past; he laid stress upon the urgent need of a higher and sterner morality to cope with the moral perils of the hour, especially noting the growing laxity that accompanied the decline of discredited forms of religious belief; and he placed peculiar emphasis upon the duty of caring for the moral education of the young. The society thus initiated grew rapidly, and soon gave practical effect to his programme. Within a few years it had established a free kindergarten for the children of the poor, the first of its kind in New York; and this developed into a workingman's school, based upon the Froebelian pedagogy, which was the first school to introduce manual training and systematic ethical instruction into the curriculum. It also inaugurated a system of trained nurses for the poor, which has since become an adjunct of dispensary out-door relief in the city. Other social reforms were inaugurated which developed into public institutions.

From New York the movement spread to Chicago, Philadelphia, and St. Louis, where societies were founded on the order of the parent one. These American societies, while loosely federated in a union, maintain an individuality of their own, and have developed different forms of activity according to local needs and circumstances. They all hold Sunday exercises, which consist for the most part of music, readings, and an address. All admit to membership on a simple declaration of devotion to the ethical ends set up. All attach great importance to the moral and religious education of the young, and maintain well-organized Sunday schools and associations and clubs of young men and young women devoted to the same end and to various kinds of practical work.

That the movement initiated in America expressed no merely local phase of religious development is evident

by its still more rapid spread in Europe. American influences led to the establishment in 1886 of the London Ethical Society with which Profs. Muirhead, Bosanquet, Bonar, and others, upon whom the ethical influence of Thomas Hill Green of Oxford had been profound, were identified; and under its auspices lectures were given at Toynbee Hall and elsewhere by many men at the universities and in public life who felt the importance of the new ethical propaganda, such as Seeley, Caird, Leslie Stephen, etc. Under the energetic leadership of Dr. Stanton Coit the ethical societies have multiplied rapidly in London and in the provinces, where also several of the Labor Churches have affiliated themselves with the ethical movement. A Union of Ethical Societies (14 or more), and a Moral Instruction League (to introduce systematic non-theological, moral instruction into all schools) are in vigorous activity; a weekly paper, *Ethics*, has been maintained for several years; and there has been a considerable output of literature.

The new movement was finding, meanwhile, favorable soil on the Continent. A centre of activity was established at Berlin, where Prof. Gizycki, Prof. William Foerster, and others identified themselves with the cause. Societies were in time established at Munich, Dresden, Danzig, Freyburg, Stuttgart, Breslau, Frankfort, Jena, Magdeburg, Strasburg, Ulm, Königsberg; and in Austria at Vienna, in Italy at Venice and Rome, in Switzerland at Zürich and Lausanne; and in France through the Union pour L'Action Morale (1891) which found spokesmen in M. Emil Desjardins (notably in his stirring brochure *Le Devoir Present*), and in other well-known writers. Among the latest additions to the ethical societies is one at Tokyo in Japan. The German societies support a weekly paper, *Ethische Kultur*, published at Berlin; and the Parisian society a monthly, entitled *La Coöpération des Idées*.

ETHICS. The term Ethics is derived from the Greek words, *ethos* and *ethika* which signify, the one the abiding place of men and animals, the other the dispositions developed through association in such places. Accordingly, Ethics deals with that side of life in which activities of men are fashioned into habits whose worth is determined by the standards of the group life into which they have been born. Such standards are to be found everywhere among men, the distinctions made by them being conveyed by terms such as ought and ought-not, right and wrong, good and bad, duty and disobedience.

The study of Ethics is thus a very definite thing. Its data consist, first, in all human acts which are subject to the control of the standards above mentioned and which constitute the moralities and immoralities of men; second, in the standards themselves as concerns their character, origin and application; third, in the habits and courses of conduct in which human beings, whether as societies or as individuals, have embodied their standard-regulated acts. None the less it is also a most complex affair, for

its scope is as wide as humanity and its intent as deep as life.

Accordingly, an adequate investigation of Ethics would include (1) a detailed study of morality and immorality among peoples who live or have lived under the control of custom, i.e., under the sway of standards which they have not deliberately fabricated for themselves but which they have inherited. To this study the title 'Unreflective Ethics' or 'The Ethics of Custom' may be given. It draws largely upon anthropology, history, literature, the records of travels, etc. for its data. By its means the student is enabled to observe group life and its regulative, ethical phase in a simple näive form; to detect its principles of development and the influence of tradition; to generalize as to the underlying forces, the function and the goal of the moral life. The meaning of such development, function, and goal become explicit, however, only in (2) 'Reflective Ethics.' This portion of ethical enquiry includes the study of the moralities and immoralities of men in that stage of human development wherein the deliberate construction of standards and methods of living has been undertaken. Here we perceive human conduct rising slowly to the condition of open-eyed, self-regulated, self-controlled procedure both individually and socially. Reflective Ethics sub-divides, accordingly, into the study (A) of 'The Ethics of the Individual,' the study of the moral life as it has come to self-consciousness in and constitutes the personal experience of an Individual: (B) of 'The Ethics of the State,' the study of the moral life in the group organization fabricated deliberately by men and known as the state. Put briefly, the contents of these studies are as follows:

(A) *Ethics of the Individual.*—The individual is the vehicle of group life. Through individuals and through individuals alone is group life reproduced, embodied, and developed. Hence, when he comes to self-consciousness of himself and strives to re-model social life in some respect, the individual awakens to a reflective appreciation not only of the already formed code of conduct, but also, and more pressingly, of the moral life as an experience of which he is the centre of realization and the medium of transmission. This experience expresses itself in volition, conscience, and character. What then are these activities and how may they be described?

Voluntary action is the material of which the moralities and immoralities of men are fashioned. For individual morality is a self-conscious affair, and, of human action volition alone is self-consciously performed. It is ever intentional; it is done from a deliberate motive; it is the realization of a purpose. As an intention, voluntary action is never blind but is always the foresight of an end to be reached. Whenever one wills, he knows what he is about, what he is to do, where his course is leading him, he is consciously on the move toward a definite objective.

Equally is the act motivated. To become an act of will a reaction must not only be turned into a foresight but also into an end appreciated, an end desired. Whenever a projected course of conduct arouses one's feeling to the point of desire and of willingness, it becomes one's movement, one's motive, inasmuch as it has been accepted consciously by one's self. Finally, as an intentional, desired movement, as the projection of a course to be realized, every voluntary act is the embodiment of a purpose. It is not forced but chosen, not compelled but free, the outward expression of one's own inner nature.

Conscience is the moral standard. It is that function within each individual which measures or determines the meaning, the significance, the value of his actions. It has been described as an Impartial Spectator who views and appraises the individual acts with fine objectivity of attitude; again as a Moral Sense akin in its immediacy to feeling and in the refinement of its appreciations to æsthetic sensibility; finally, as a Law Giver whose deliverances are as universal as Truth and whose commands are categorically or unconditionally imperative. These descriptions, now classic, serve to indicate that conscience is a unity in variety and includes an intellectual, a feeling, and a conative measurement of actions within its function. It is indeed an insight into, an appreciation of, an attitude toward action. And although, concretely, individuals vary as much in respect to conscience as they do to temperament, still in the conscience of every individual the three aspects of life are represented. Hence there is about conscience a self-consciousness similar to that found in voluntary action. Yet there is a difference. Conscience characterizes its self-consciousness in that it does not limit its function to the mere description of actions as events here and now but goes on to weigh and measure them as tendencies in the total lives of ourselves or our neighbors. In other words it is not only a standard but also an ideal. It is a standard inasmuch as it brings particular acts to measurement: it is an ideal in that it expresses their organization, their interrelations in the regulation of human life as a whole. Again, Conscience seen in its function as an analytic surveyor is a standard: regarded as a synthetic regulator it is an ideal. In both cases it is the expression of the total drift of one's individual insights, appreciations, attitudes with reference to the significance of voluntary actions in the movement of one's life. Accordingly, it varies with the temperament, the environment, the education of an individual.

Character is the concrete moral function, the individual's voluntary actions regulated by conscience or defiant of it and woven into the definite habits of a continuous life. Desirable character—virtue—is action wrought out into habits fashioned under the guidance of conscience. Undesirable character—vice—disregards con-

science. Accordingly, character whether virtuous or vicious is the acme of self-conscious activity. The material from which character is fabricated, the standard or ideal by which this material is measured and organized is also self-conscious. Hence for character one is responsible. In material and in organization it is one's own self-expression and self-realization. It is not inborn but acquired, not forced but chosen, not blind but intelligent, not impulsive but habitual, the measure of self-control exercised and the life values realized by each individual amid the concrete situations of his own life.

Now just as the character of an individual is inaccessible wherever insight fails, so in like manner the characters of individuals, generally, remain mysteries until we seek to understand the characteristics of the group to which they belong. For while it is true that the individual is the vehicle of social life it is equally true that society is the medium in which individuals live and have their being. Accordingly the content and intent of individual life are to be found in the interactivities of group living.

(B) *Ethics of the State.*—The state is that form of group life in which the custom of primitive peoples has been modified deliberately to meet the wishes of some member or members of the group. Custom tends to persist unchanged from age to age. It demands unswerving loyalty and unquestioning obedience from those who live under it. The emergence of the State changes all this. Its aim is to make social organization conform to the desires of individuals. These desires may be limited to a single person or to a small group of persons; or they may be extended to all of the people under some form of democratic or representative government. No single form as yet prevails and the development of the state is very incomplete. Custom still makes itself felt and social growth has been slow. Yet from the days when the headman, or priest, or war-leader, or whoever first set himself the task of bending the regulations of custom to his own or his people's benefit, the state has existed and has gradually been transforming custom into its own more self-conscious forms. What then in the state is correspondent to and is the corporate embodiment of volition, of conscience, of character? Wherein shall we find morality writ large as a factor of social life in its reflective form? We answer—in vocation, in institution, and in good citizenship.

Vocation is an individual's self-conscious, deliberate, chosen course of conduct expressed in a social medium. It is that to which he gives his whole life and by means of which he finds and maintains the social perspective of his individual activities. In undertaking a vocation an individual acknowledges his social relationships and responsibility: by his method of exercising that vocation both itself and in relation to other vocations he manifests the virtue or viciousness of his character. His character

in short, is not his mere individual constitution. Just as truly is it his method of living with his fellows and before them. Hence as vocations have won greater and greater freedom from the trammels of custom and of caste, and social life has been so re-modelled as to give freer and larger play to the aptitudes of individuals, morality has also become a richer and freer thing. Vocations have saturated themselves with the values accorded to them by the progress of social life. These values have been organized in the state conscience, viz., its institutions.

It is in the institutions of state life in all their varied complexity—legal, educational, æsthetic, religious, industrial, etc., that we find the reflective source of each successive generation's insight into the wrought-out standards and ideals of the race. These institutions bear the stamp of many peoples and have not yet been organized into common standards generally accepted. In every institution great divergences of type still mark the procedure of different civilizations. Still it is in these institutions alone that we find the social standards and ideals of which the consciences of individuals are equally the vehicles and the agents of reconstruction.

It follows, therefore, that we must look for virtuous character, on its social side, in a form of activity in which some vocation is exercised by an individual and in which the course of conduct consequent to the fulfilment of that vocation is regulated by knowledge of and loyalty to the highest expressions of social institutions. But such a course of conduct is the life of the good citizen.

Ethics, th , is the study of human activity regulated by human standards which are fashioned to meet human needs. Its end, whether unreflective or reflective, whether individual or state is the education of individual conduct into the most efficient means for the attainment of the fullest degree of social well-being at any given time and in the given circumstances.

This end concretely defined must serve as the standard by which the varying theories of life, propounded in the development of man's history, are to be estimated. Of these theories with all their oppositions and contradictions it may be said that each has abstracted and set up as the total meaning some aspect of man's individual or social well-being. Thus the more the distinctive character of each has been defined the more its limitations have been revealed and the necessity of bringing each into natural relationship to every other seen. For only the full movement of life in its concrete setting can satisfy the myriad-sided demands which human life and well-being make upon it. To illustrate—Hedonism maintains that pleasure is the end, the *summum bonum*, of living, dwelling sometimes upon the happiness of the individual simply and sometimes upon the greatest happiness of the greatest number. This would be true only if life could be spelled exclusively in terms of pleasure. Rigorism,

on the contrary, tends to deny pleasure, forgetting that pleasure is an important ingredient in all life. Rigorism would also reduce life to the domination of mere rules. This is to overlook the fact that rules were made for life and not life for rules. Perfectionism teaches the all-round fulfilment of life either for individuals or for society but would limit this fulfilment to the realization of a static ideal which transcends the here and now. But ideals whether they be those of individuals or of races are not transcendent and static things nor do they point to a mere beyond. Rather are they formulæ for regulating and enriching life as it is. Ethics stands for the best realization of the whole man but it knows of no definition of man save as he is an actor in the present scene of life. Individualism would exclude social considerations from the moral code; socialism is inimical to individual desires. Yet neither the individual nor society has meaning apart from the other. Utilitarianism demands that morality should not be abstract but concrete, that it should be practical and should give a reason for the respect it demands by its efficiency in regulating naturally the actual life of man. Intuitionism would defend the objectivity and universality of moral principles but confuses the issue by refusing to give a natural history of these principles. Evolutionary ethics on the contrary while exhibiting the natural development of moral ideas and ideals too frequently fails in bringing to light the peculiar fineness in the qualities of the morality exhibited by life and maintained in theory by intuitionists.

In like manner curious and one-sided theories have been formed of the nature of volition and of conscience. Concerning the will the Libertarian has maintained that to be free, volition must be removed from the sphere of natural processes and laws: The Necessitarian has contended that a natural view must be taken of all activities that operate in the world and claim the attention of men. Yet for him such a natural view means the reduction of volition to the level of physical forces. Between the two views volition has fared hard. Of conscience it has been maintained that it is an innate endowment of the human soul of which no history can be given. Such a view cuts off conscience from the renewing and enriching processes to be found alone in development. It thereby imposes prejudice where insight should obtain. It makes moral ideals the mere record of the past and not also the prophecy of the future. On the other hand an historical treatment at times is carried away by the fact of change and reduces conscience to mere relativity and morality to opportunism.

The problems involved in the more theoretical aspects of Ethics are thus seen to be large. Each demands treatment on its own account. And yet it may also be seen that the solution of these problems can come only through a thorough-going acquaintance with the facts and principles of the moral life as displayed in human history.

ETHIOPIA, *ē-thĭ-ō-pĭ-a:* the biblical *Kush.* Originally the nations inhabiting the southern part of the globe, as known to the ancients; or rather, all men of dark-brown or black color, were called Ethiopians (Gr. *aithō—ōps,* sun-burned). Later, this name was given more particularly to the inhabitants of the countries s. of Libya and Egypt, or the Upper Nile, extending from 10°—25° n. lat. 45°—58° e. long.—the present Nubia, Sennaar, Kordofan, Abyssinia. The accounts which the ancients have left with respect to this people are, even when not entirely fabulous, extremely scanty and untrustworthy, as both Greeks and Romans never passed beyond Napata, 19° n. lat. From the Homeric age down to Ptolemy—who is somewhat better informed—these regions were reported as peopled by Pygmies, Troglodytes (dwellers in caverns), Blemmyes (hideous men), Macrobii (long-lived men), etc., besides being divided into the lands of cinnamon, myrrh, of elephant-eaters, fish-eaters, tortoise-eaters, serpent-eaters, etc. The only portion of ancient records which does contain something akin to historical accounts of these regions is that which refers to Meroë, an island formed by the rivers Astaphus and Astaboras, tributaries of the Nile. There stood, from times immemorial, an oracle of Jupiter Ammon. This, and the central position of the island, together with the extraordinary fertility of its soil, the abundance of animals, metals, etc., made it not only the chief place of resort for all the inhabitants of the adjacent parts, especially the numerous nomad tribes, but also the emporium for India, Arabia, Ethiopia, Egypt, Libya, and Carthage. Thus it grew so rapidly, that about B.C. 1,000 it counted among the most powerful states of the ancient world; and about B.C. 760, having ever since Sesostris been tributary to Egypt, it succeeded, under Sabacus, in shaking off the Egyptian yoke, and continued, in his turn, to hold Egypt for about 60 years. During the reign of Psammetichus, 240,000 Egyptians settled in Meroë, which, the greater part of the immigrants being artisans, traders, etc., advanced still more. Many new cities were built, and the state was in the most flourishing condition, when it was conquered by Cambyses, about B.C. 530. He fortified the capital town, and called it Meroë. After the destruction of Thebes by Cambyses, most of the inhabitants of that city took refuge there, and made the country still more Egyptian. Ergamenes transformed its theocracy into a military monarchy, in the 3d c. Under Augustus, Meroë was conquered, and a Queen Candace is mentioned as his vassal. Under Nero, nothing but ruins marked the place of this once powerful and highly civilized state. Till this day, remnants of mighty buildings, covered with sculptures are frequently met with in those parts.

Their religion, art, form of government, and civilization, generally were—in their chief features at least—so identical with the Egyptian as to have given rise to the ques-

tion, which of the two nations imparted their knowledge to the other: see EGYPT.

The history of the descendants of the ancient Ethiopians —inhabitants of the present Habesch, or Abyssinia—may be outlined as follows from their very poor and scanty native chronicles.

According to these, the son of Solomon and the Queen of Sheba (Makeda as they, Balkis as the Arabians historians call her), named Menilehek, was the first king of the Ethiopians. Few king's names occur before the time of Christ, when Bazen occupied the throne. The missionary Frumentius (330) found two brothers (Christians) reigning Abreha and Azbeha. During the time of the Greek emperor Justin (522), King Elezbass destroyed the state of the Homerites in Asia, in order to revenge their persecutions of Christians; and was canonized. From 960 to 1300, another dynasty, the Zagoean, held the chief power, all the members of the Solomonic dynasty, save one, having been murdered by Esal, who made her son king. In 1300, Ikon-Amlak, descendant of this one scion of the house of David, who had fled to Sheba, regained possession of the country, and made Sheba, instead of Axum, the seat of government. To this day, his family rules the country. Frequent revolutions within, brought about especially by the religious squabbles imported by the Portuguese toward the end of the 15th c., and a host of enemies all around—the most formidable of whom were wild nomad tribes of the desert—forced the kings more than once to apply for foreign help; among others, that of the Turks 1508; and the affairs of the modern state have at all times been anything but prosperous. Special mention is made of King Zara-Jakob (Constantine), 1434–68, who sent an embassy to the church-council at Florence; of Aznaf-Saged (Claudius), 1540–59, during whose reign Christoph. de Gama from Portugal lived in Ethiopia, and made common cause with him against his enemies. This king also wrote a confession of faith, in which he defended his church both against Jesuits and the charge of leaning toward Judaism. Socinios (1605–32) openly professed Roman views; but his son Facilides soon expelled the Jesuits and their friends from the country, and put an end to the Roman influence. Among these friends was also Abba Gregorius, later the friend of the great Ethiopologist Ludolf, who, having made his acquaintance at Rome, induced him to migrate to Gotha, where he remained until his death. Under Joas (1753–69), the Gallas, a nomad tribe, hitherto the mightiest and most dangerous enemies of the Ethiopians, not only gained admission to all the offices in the state, but acquired almost absolute power. One of them (Susul Michael), holding the place of Râsh, or prime-minister and chief-commander of the troops, proved a very great friend to Bruce, to whom he intrusted the government of a province. The several provinces remained practically independent, each chief striving to subdue his neighbors, till in 1855 the chieftain afterward known as Theodore (q.v.) attained supremacy: see also ABYSSINIA. The king resided by

rarely in the city, and for the most part remained with his soldiers in the camp. His official name was Negus, or, in full, Ńegus Nagass Za-itjopja, King of the Kings of Ethiopia—alluding to the chiefs of the towns and provinces. The soldiers receive no pay, but rely on plunder; and have proved themselves able to fight bravely.

Emigrants, as were beyond doubt the earliest settlers in Ethiopia, from the other side of the Arabian isthmus, it is but natural that the structure of their language, as well as that of their own bodies, should bear traces of their Shemitic origin. The reason of this emigration is contained in the very name of this language, which is called *Geez*—free, affording the most striking parallel to the designation *Franc*—French. Free places of habitation were what they came in search of. The name Ethiopian, or, as they call it, Ithiopjawan, they adopted from the Greeks at a very late period. This their oldest language, *Leshana Geez*, was suppressed by a royal decree of Ikon-Amlak, in the 14th c., and the Amharic adopted as the court language. Ever since, the Geez has, with exception of the province of Tigré, where it is still spoken (with slight idiomatic changes), remained the *Leshana Mazhaf*, the language of books and of the church. It is exclusively used in writing, even of ordinary letters, and the educated alone understand it. Its general structure, comes as close to that of the Arabic as a dialect can and must. A great many of its words are still classical Arabic; others resemble more the Hebrew and its two Chaldee dialects, the Aramaic and Syriac; others, again, belong to African dialects; and many, as the names of the months, are Greek. It has 26 letters, 22 of which bear the ancient Shemitic stamp, and exhibit the greatest likeness to the Phœnician, the common original alphabet; and seven vowels, including a very short *e*, which sounds precisely like the Hebrew Schĕwa. These vowels are represented by little hooks, and remain inseparably attached to their respective letters; and as the Geez, unlike all its sister-languages, is never written without vowels, the alphabet becomes a syllabary with 182 characters. Another difference exists in its being written from left to right—from which some have concluded that the Greeks introduced writing in Ethiopia; forgetting, in the first place, that Greek itself was frequently written from right to left, and that Zend, certain cuneiforms, hieroglyphs, etc., are likewise written from left to right. Not entering here into the grammatical minutiæ of the language; we will mention that out of the ten conjugations, eight are Arabic; that there is a double infinitive, but no participle and no dual; that the formation of the so-called plural, and of declension generally, point to that very remote period when the Hebrew and Arabic made use of the same grammatical processes. There are no diacritical marks employed in writing; the letters are not combined, and the words are separated by two dots.

Although there can be no doubt of the existence of a rich literature in a flourishing country like Ethiopia anterior to Christ, still owing both to frequent internal convulsions

and the misguided zeal of the early Christian missionaries, who here and elsewhere considered it their first duty to destroy all the ancient records of which they could lay hold, nothing but a few half-erased inscriptions have survived. The earliest existing document of post-Christian literature is a complete translation of the Bible, probably by Frumentius: see FRUMENTIUS. The Old Testament, probably a translation from the Alexandrine version of the LXX., consists of four parts: 1, the Law, or Octateu-chos (five books of Moses, Joshua, Judges, Ruth); 2, Kings; 3, Solomon; 4, Prophets, and two books of the Maccabees. The New Testament consists of—1, Gospels; 2, Acts; 3, Paulus; 4, Apostolus. A very peculiar book, Henoch, also belongs to the literature of the Old Testament: see ENOCH. The New Testament comprises likewise another book, Senodas, containing the pseudo-Clementine or apostolical constitutions. The Ethiopians have a liturgy (*Kanan Kedaso*—Holy Kanon) and a symbolico-dogmatical work (*Haimanota Abau*—Belief of the Fathers), containing portions of homilies of the Greek Fathers, Athanasius, Basil the Great, Chrysostom, Cyril, Gregory of Nyssa and Nazianzen. Besides these, they have martyrologies, called Synaxar. They employ in this their sacred literature a peculiar kind of rhythm without a distinct metre. Any number of rhyming lines forms a stanza, without reference to the number of words constituting the verse, or of verses constituting the stanza. They also use certain phrases as a refrain—not unlike the manner of the mediæval Hebrew Pizmon: see JEWISH LITURGY. As to general literature, they have neither a written book of laws, nor a grammar of their own language, nor, in fact, anything worth mentioning, except a *Chronicle of Axum and Chronicles of Abyssinia.* They are very fond, however, of riddles, wise saws, and the like, so fascinating to the Eastern mind. They have a Dictionary, but most of its explanations and translations are utterly wrong. The language proved a great puzzle. Potgen, a Cologne church-provost, happening to be at Rome at the beginning of the 16th c., there made the acquaintance of native Ethiopians, and became the first to enlighten the world on the nature of this occult language. After him came the Carmelite Jacob Marianus Victorius from Reate, who wrote *Institutiones Linguæ Chaldææ S. Æthiop.* (Rome 1548), an entirely worthless book; then Wemmers, who 1683 published an Ethiopian grammar and dictionary. The principal investigator, however, is Hiob Ludulf from Gotha, who, aided by the Abba Gregorius before mentioned, and supported by his own extraordinary linguistic talents and indomitable energy, acquired such a power over this language, that notwithstanding the number of eminent Orientalists, such as Platt, Lawrence, Dorn, Hupfeld, Hoffmann, Roediger, Ewald, Isenberg, Blumen-

bach, etc., who have since worked in this field, his books, as re-edited by Dillmann, still hold the first place. It is hardly necessary to add, that the Ethiopian is one of the most important and indispensable languages to the Shemitic scholar, containing as it does a great many words and forms of a date anterior to the separation of the different Shemitic dialects. Among the most important Ethiopian books printed in Europe are the Psalms, edited with a Latin translation by Ludolf (Frankfort 1701); the New Testament, (Rome 1548); the book of *Henoch* (Lond. 1840); *Ascensio Isaiæ Vatis*, with a Latin translation by Lawrence (Oxford 1819); *Didascalia*, or apostolical constitution of the Abyssinian Church (Lond. 1834).—Ludolf's works are—*Grammatica Æthiopica* (Lond. 1661; new. ed. by Dillmann 1857); *Lexicon Æthiopicum* (Frankfort 1699; new. ed. 1862); *Historia Æthiopica* (1681). Since the English expedition to Abyssinia, the British museum possesses a larger number of Ethiopic MSS. than any other library.

ETHIOPIAN, n. *ē′thĭ-ō′pĭ-ăn*, or ETHIOP, n. *ē′thĭ-ŏp* [Gr. *aithĭŏps*, sun-burnt, swarthy—from *aithein*, to light up, to burn; *ōps*, the face, the countenance]: a native of Ethiopia, and as such supposed to be black: ADJ. pertaining to. ETHIOPIA, n. *ē′thĭ-ō′pĭ-ă*, a country of Africa, which included the modern Abyssinia and several adjacent states. E′THIOP′IC, a. *-ŏp′ĭk*, pertaining to Ethiopia or its language; applied to the negro race as inhabiting Africa.

E′THIOPS [see ÆTHIOPS]: term applied by the ancient chemists to oxides and the sulphides of the metals which had a dull, dingy, or black appearance. Thus, *Ethiops Martialis* was the mixture of protoxide and peroxide of iron, known as the black oxide; *Ethiops Mineral Ethiops* or *Narcoticus*, the black gray sulphuret of mercury procured by triturating in a mortar a mixture of mercury and sulphur; and *Ethiops per se*, was obtained by agitating commercial mercury for weeks or months, when the oxygen of the air slowly formed the black oxide of mercury.

ETHMOID, a. *ĕth′moyd* [Gr. *ethmos*, a sieve; *eidos*, appearance]: perforated with holes like a sieve—applied to the bone which forms the roof of the nose, which is perforated like a sieve for the passage of the olfactory nerves. It is one of the eight bones which collectively form the cavity of the cranium. It is of somewhat cubical, form, and is between the two orbits, at the root of the nose. Its upper surface is perforated by a number of small openings, through which the filaments of the olfactory nerve pass downward from the interior of the skull to the seat of the sense of smell, in the upper part of the nose. It consists of a perpendicular central plate or lamella, which articulates with the vomer and with the central fibocartilage, and thus assists in forming the septum or partition between the two nostrils. The lateral masses present a very complicated arrangement, and are so planned as to give in a small space a very

large amount of surface, on which the filaments of the olfactory nerve are spread. In comparative anatomy we find a direct ratio between the development of these masses and the acuteness of the sense of smell. See NOSE AND THE SENSE OF SMELL. ETHMO-CRANIAL ANGLE, *eth'mo-krā'-nĭ-al*, in *anat.*, the angle formed by the basicranial axis with the line of the cribriform plate (upper surface) of the ethmoid bone. ETHMO-TURBINALS, n. *-tėr'bĭ-malz*, in *anat.*, two lateral masses, one on each side of the central vertical plate of the ethmoid bone.

ETHNARCH: literally from the Greek, head of a community; a prefect, rather than a ruler. An important figure in the Greco-Roman world, the title given to Simon the Maccabee, to Herod and his son Archelaus, to the heads of the Jews of Egypt, and to an official of Damascus in the reign of the Nabatean Aretas IV. (II. Cor. XI. 32), and elsewhere.

ETHNICAL, a. *ĕth'nĭ-kăl*, or ETHNIC, a. *ĕth'nĭk* [Gr. *ethnĭkŏs*, pagan, heathen—from *ĕthnŏs*, a tribe, a nation]: relating to the different races or nations of mankind; heathen; gentile. ETH'NICALLY, ad. *-lĭ*. ETH'NICISM, n. *-sĭzm*, heathenism. ETHNOGRAPHY, n. *ĕth-nŏg'ră-fĭ* [Gr. *ethnos*, a race, a nation; *graphō*, I write]: an account or description of the origin, dispersion, connection, and characteristics of the various races of mankind. ETH'NOGRAPH'IC, a. *-nō-grăf'ĭk*, pertaining to the origin, dispersion, etc., of mankind; also ETH'NOGRAPH'ICAL, a. *-ĭ-kăl*. ETHNOG'RAPHER, n. *-nŏg'ră-fėr*, one who cultivates or writes on the science of ethnography. ETHNOL'OGY, n. *-nŏl'ō-jĭ* [Gr. *logos*, discourse]: the science of races, in all that relates to physical features, language, manners, religion, and other characteristics. ETH'NOLOG'ICAL, a. *-nō-lŏj'ĭ-kăl*, pertaining to ethnology. ETHNOL'OGIST, n. *-nŏl'ō-jĭst*, one who.

ETHNOG'RAPHY, a branch of ETHNOLOGY: the vast science which treats of mankind as a whole, their origin and their development in language, art, religion, and political ideas, from barbarism into civilization. The German scientists class ethnology as a science standing midway between natural history and philosophy. As natural history, in the ordinary sense of the term, is a classification and description of the lower animals, ethnology may fairly be considered as a classification of the various families of the human race, based on the observation of their physical characters, and geographical distribution. The word ethnography was first used in a book published at Nuremberg in 1791, and entitled *An Ethnographical Picture Gallery*. The modern science of ethnography dates from the year 1829 when Milne-Edwards wrote to Thierry, with the result that the Société Ethnologique was founded. The founding of an ethnographic museum was suggested by Jomard in 1843, and built some years later in Paris. Since that time the study has been thoroughly systematized all over the world. See ETHNOLOGY.

ETHNOLOGY.

ETHNOLOGY, *eth-nol'o-ji* (Gr. *ethnos*, race tribe, people; *logos*, discourse), the historical, analytical and interpretative branch of the science of ANTHROPOLOGY (q.v.), concerning itself with the resemblances and differences of all kinds (physical, psychical, moral, social, religious etc.) existing, or having existed, among the various 'races and peoples' who constitute the one human species now inhabiting the globe, to which have belonged also all other 'races' of which history has preserved any record whatsoever. It treats particularly of the origin, nature and significance of such resemblances and differences and their past and present distribution among the world's inhabitants, their rôle in the history of mankind, the development of civilization, etc. The chief sub-divisions of Ethnology are as follows:

1. *Sociology*, treating of the origin, nature, significance, functions, etc., of human institutions,—societies and social devices, marriage and kindred institutions, law and government, games and other social activities and amusements. See SOCIOLOGY.

2. *Technology*, including the whole range of arts and industries, their origin, nature, significance, and rôle in human history,—utilitarian, industrial, æsthetic, decorative, pleasure-giving.

3. *Science of Religion*, treating, in like comprehensive and exhaustive manner, of the phenomena of religion in the race; the religious sentiment in all its aspects. See RELIGION.

4. *Philology (Linguistics)*, treating of the origin, growth, nature, significance, and rôle in human history of language and of languages. See PHILOLOGY.

5. *Mythology and Folk-Lore*, treating of man's thoughts about 'the universe and all that therein is,' which do not come under the rubrics of scientific knowledge, 'civilized' philosophy, or approved religion; such myths, legends, beliefs and ideas are characteristic of savage and barbarous races, and are likewise commonly found among the ignorant sections of many civilized communities, 'the folk,' as they are often called. See FOLK-LORE; MYTHOLOGY.

It will be seen, from the wide field covered by Ethnology, that classifications of mankind of an ethnic sort may be made in great variety, and be some of small and others of very great significance.

Monogeny and Polygeny.—Formerly ethnologists were divided into two antagonistic schools, the monogenists, who believed in the origin of all the human 'races,' so-called, from a single primitive stock; and the polygenists, who assumed independent origins for each of the chief varieties of mankind. Some of the polygenists of more recent date saw parallelisms between human 'races' and the different species of anthropoids and maintained that to each one of the latter (gorilla,

orang-utan, chimpanzee) corresponded one of the former, the Negro, of course, being regarded as the most ape-like. And other equally far-fetched ideas were once in vogue. But the predominance of the theory of evolution, however, with its practical requirement of a theory of racial unity to account for the origin and development of man and his achievements as such has caused the monogenistic view to be generally accepted in anthropology. Thus all ethnological 'systems' of classification have to do with 'ethnic groups,' or 'varieties' of the one species or race of man, and not with characteristics of several entirely different and independent races of man. In the employment of the term 'race,' there is no absolute agreement among the ethnologists of Europe and America, although many seek to use the word in a hard and fast way as applying only to certain groups of mankind characterized by persistent marked physical peculiarities, easily observed and modifiable only with difficulty. Besides 'races' there are recognized other less definitely featured and more loosely constituted ethnic entities, commonly designated 'peoples,' 'nations,' 'tribes.' The term 'type' now much in use, approaches in meaning sometimes 'race,' and sometimes 'people,'—'a typical Englishman,' 'the Mongolian type,' etc. In the ordinary speech of to-day we hear even of 'the Anglo-Saxon race' and the people of the United States are cited as 'a race in the making.' Other interesting terms more or less in use are 'higher and lower races,' 'race prejudice,' 'race-soul,' the last a favorite expression with the 'race-psychologists,' especially the French school of Le Bon, etc. To our 'race-psychology' correspond French 'psychologie des peuples (races)' and German 'Völkerpsychologie,' 'Rassenpsychologie,' etc. In the last ten years a large number of monographs have appeared on such subjects as 'The Psychology of the English People,' 'L'âme nègre,' etc., atempts to describe the essential psycho-physical, intellectual, moral and religious characteristics of the people dealt with. In an essay published in 1892, Mantegazza, the Italian anthropologist and psychologist, sketched with epigrammatic skill the best-known features of five great ethnic types: The Italian is æsthetically serene and an artist in speech and movement; the Frenchman is ready to leap, and a vivacious pleasure-seeker; the Spaniard is calmly and voluptuously arrogant, and is an Italian orientalized; the German is filled with the thought that is whirling in his brain, and is a slow-moving philosopher; the Englishman is contemptuous and energetic, and is a German without *bonhomie*. In a legend from the Negroes of Louisiana, the Creator is represented as making the first Frenchman out of a butterfly, and the first Englishman out of an ant. This sort of

'ethnology' is prevalent among all tribes and peoples.

'Higher' and 'Lower' Races.—The expression 'higher and lower races' is often used to-day in an easy off-hand way, by members of the white race especially, to distinguish between themselves as judged by themselves and the rest of mankind, oblivious of the share of the 'lower' races of man in the production and the development of the civilizations of Egypt, Mesopotamia, China, and, more recently, and even more notably, Japan. The employment of these epithets often has little more truth about it than the 'Hellenes and barbarians' of the old Greeks, when theirs was not the only culture-center on the globe; the 'Jew and gentile' of later Hebraism; and the more modern 'Christian and pagan (heathen).' All such ready-made divisions connote more the prejudices of the race that uses them than they embody real distinctions of value between the varieties of man. They are likewise often extremely unjust, since the so-called 'higher' races have reached their present 'high' position not infrequently by a series of environmental stimuli, or by the disappearance or extermination of all competitors, and not at all through the possession, as a race, of physical, mental and moral qualities absolutely superior to those of their ancestors and contemporaries of other stocks and types. Rome, Greece, Egypt, Israel, Babylon, were but a very few of the civilizations that began along the shores of the Mediterranean; others that did not survive, or were driven to the wall early in their existence, might very well have developed some other part of human culture to as high a state of perfection as the Romans did government, the Greeks art, the Hebrews religion. And we are now only learning how great was really the share of the primitive peoples of the Mediterranean in the evolution of its remarkable expressions of human genius in art, literature, religion and the like. The Greeks, long after they used marble, painted their creations red in imitation of the painted wooden statues of their predecessors; and, if we believe Sarsasin, the Doric temple is nothing but the beautification of the pile-dwelling once so common in prehistoric times over a large portion of central and southern Europe, etc. The beginnings of the telephone and the telegraph are seen in the drum-communication system of certain African Negroes; the inflated bladder used by the Eskimo to protect his skin-boat as he draws it up over the stony beach, ends in the tire of the bicycle and the automobile; and the practice of placing together five or six blow-pipes, instead of using one only, a device of some American Indians, crudely anticipates the revolver. And, if one enumerates the things the 'higher' races have borrowed from the 'lower,' the whites in America from the Indians, the whites in Europe from the yellow race,

and the whites in Africa from the black, one is soon convinced how little there is that is the unquestioned creation and manufacture of one race unaided and uninspired by the past or the present stimulus of another. Again America affords the world-example, for here the so-called 'higher and lower types' of the white race are fusing, with additions from other races still 'lower' (in the opinion of those whose shibboleth these epithets still are). The real distinctions between the races of man in relation to capacity for culture are not to be determined by the interested judgment of all races by one, nor yet by 'benevolent assimilation' and other colonial experiments of democracies, but by the evolution of such peoples as the Chinese and the Japanese and their independent share in the civilization and progress of the world. One does not expect the rapidly decreasing and numerically insignificant race of the Bushmen to be of much account in the future history of Africa, but the Zulus are not to be excluded from it; the Eskimo are not likely to play an important rôle in the civilization of North America, but in South America the day of the Indian is not yet gone, and some great regions of the continent are as Indian as they were at the time of the coming of the white man, while the memory of Juarez, and the Indian share in the blood of Diaz indicate that Mexico is not yet a mere 'white man's country.'

Race and Language.—At the present moment, physical diversity of race does not imply always difference in language, nor does unity of speech necessarily indicate oneness of physical type. Mixture of physical characters and mixture of languages are phenomena found all over the globe, at an early period in the history of man, as to-day. The American Negroes speak English, as do now the Iroquois Indians of Ontario; descendants of the cave-men of ancient France now employ a language sprung from Latin, as do also many whose ancestors were Teutonic (Normans, etc.); Bulgarians, of Mongolian descent, have a Slavonic mother-tongue; and English, French, Portuguese, Spanish, Arabic, Hindu, Malay, etc., have been imposed upon peoples of different ethnic stocks to the originators and propagators of these great languages. These adoptions of other forms of speech, as, e.g., in the case of the American Negroes, are often important evidence of actual race-mixture. And mixture of linguistic types (seen here and there in modern English) may also be proof of the same fact. The old theory of the progressive development from monosyllabic (isolating), through agglutinating and polysynthetic, to inflecting languages, with a corresponding increase in racial significance and importance and in the evolution of culture, can no longer be maintained. Aryans physically and Aryans linguistically are by no means always one and the same; nor are Mongol-

ians, Semites, or Hamites. The reasoning by which most peoples of the white race, and very few others, are credited with 'inflecting' languages is greatly at fault, while the culture-achievements of the Chinese and the Japanese make vain any attempts to correlate with exactness forms of speech and evolution in civilization. The most marked parallelism of race and general form of language appears in America, where from one end of the continent to the other the Red race has wandered developing languages which have a certain general resemblance, which distinguishes them from all such stocks as Aryan, Semitic, Bantu and the like. But, in America, we have the curious fact that this resemblance in no wise extends to vocabulary, for among the American Indians at the time of the Columbian discovery there existed north of the Mexican boundary at least 58 distinct linguistic stocks (i.e., forms of language whose vocabularies revealed absolutely no relationship one with another,—more distinct than Hebrew from English), in Mexico and Central America some 20, and in South America about some 80. Indeed, differentiation in languages seems to have been one of the chief things upon which primitive American genius expended its energies. In America, too, while such languages as the Algonkian and the Tupian disseminated themselves over vast areas of the continents, in so limited an area as the region between the mouth of the Columbia river and the Gulf of California (where 20 distinct languages were spoken) and the mountain-country of the Caucasus, diverse forms of human speech seem to pullulate. To interpret these phenomena as the result of the crowding into these areas of races and peoples that have been driven to the wall is not at all satisfactory. Another interesting explanation was offered by Horatio Hale, the eminent American ethnologist, who attributed the multiplicity of languages in California in particular, and the creation of diverse human languages in general, to 'the language-making instinct of children,' more effective in primitive culture than amid the conventions and restraints of modern civilization. To the perpetuation of changes initiated by children may thus be due many of the diversities of human speech. Certain facts observed by von Martius and others among the American Indians and other primitive peoples lend support to this ingenious theory. That language is in itself a very powerful race-unifier is seen in the history of England and the United States; here the most important factor in the amalgamation now going on is the English language, whose increasingly cosmopolitan character is the assurance of ultimate psychic unity.

Mixed Races.—In the early days of ethnological science the existence of absolutely pure human races was commonly believed in, and such peoples as the

Jews, the ancient Greeks, etc., were cited as convincing examples. But the careful researches of more recent investigators have revealed the fact that, while color of skin may serve to distinguish in general fashion the great racial divisions of humanity, no one race appears to be confined within the limits of a single type of skull, form of face, degree of ugliness or beauty, etc. The beauty of some of the modern Polynesians equals that of the ancient Greeks, in so far as perfection of physical constitution is concerned, and very pleasing facial features occur among the American Indians and numerous other primitive peoples. The existence in ancient times even of blonde and brunette varieties among the Semites is now recognized, and Deniker distinguishes in the Jews two types, one of which resembles the Arab and the other the 'Assyroid' race of the Mesopotamian monuments. The Japanese are a mixed race, consisting of a very ancient basis of Ainu (the pre-Japanese aborigines of the Islands), a later continental (Mongoloid) element, with which has been mingled in all probability a Malay or Malayoid element from the south, these three races giving rise to the 'types' existing in various proportions in different parts of the country. The Chinese too are a mixed people and several 'types' are discernible among them, northern and southern varieties in particular, the latter being shorter and more brachycephalic than the former. The existence of a *pure* 'Aryan,' or of a *pure* 'Teutonic,' or 'Anglo-Saxon' race is no longer believed in by sane ethnologists. Nor is belief in the prevalence of one physical type alone, in prehistoric Europe, e.g., maintained on good authority. Both neolithic and palæolithic man in various parts of the continent had 'types' characterized by tall and short stature, long and short heads, etc. Historically and prehistorically, the American Indians present almost all varieties of head-form, bodily structure and other physical peculiarities, and in the 'Mediterranean area' of Europe, ancient and modern, a great variety likewise occurs. Indeed, fusion of such types seems to have been almost the condition of the origin and development of great civilizations all over the globe. In ancient Egypt, from 8000 B. C. to 900 A. D., Petrie recognizes at least 12 different mixed races, and this too for only a portion of the country. In Egypt it appears that one or two thousand years are sufficient to fuse two different stocks,—how long this takes in other parts of the world is not known to a certainty; sometimes less, often more may be required. The United States at the present moment offers the most remarkable and the most successful example of race-amalgamation and race-fusion on a grand scale which the world has ever seen. And here, too, one perceives that it is not the physical characteristics

that rule the union, but the mental and moral; in other words, the mind and not the body is the arbiter in these great modern race-fusions. This will, in all probability, be true also of an American-Oriental fusion, if such a thing occurs in the future. The mixed races have ruled the world and will continue to do so to the end of time. The only way in which a 'pure' race can ever originate is when all existing ones have disappeared through world-wide fusion and a new unity is thereby created, which will be cosmopolitan.

'Fine' and 'Coarse' Types.—The existence among so many races and peoples of 'fine' and 'coarse' types of physical constitution has been emphasized recently by Baelz and other ethnologists. Some hold with Stratz that the 'fine' type is an approximation to the canons of beauty of the white race. 'Fine' and 'coarse' types have been noticed in the Japanese, Chinese, Malayo-Polynesians, African Negroes, American Indians, and various other more or less primitive peoples. Also notoriously among the different races of modern Europe. In the case of the Japanese, the 'fine' type, observable in the upper social classes, 'is characterized by a tall, slim figure; a relative dolichocephaly, elongated face, straight eyes in the men, more or less oblique and Mongoloid in the women, thin, convex, or straight nose, etc.,' and the 'coarse' type by 'a thick-set body, rounded skull, broad face with prominent cheek-bones, slightly oblique eyes, flattish nose, wide mouth (Baelz, Deniker.) These refinements of physical type are thought by many ethnologists to be the result of race-crossings and not of a general ethnic movement toward a certain physical ideal. It may be also that food and social conditions have much to do with such racial phenomena.

'Local' Races.—The existence of what may be termed 'local' races is a very interesting fact in ethnology. An example of a 'local' race on a rather large scale is the so-called 'Mediterranean race,' whose characteristic area has been the shores and islands of that great sea in Europe, Asia and Africa, in which it has originated and stimulated many diverse forms of culture. The results of the Jesup North Pacific expedition among the American Indian tribes of the region from the mouth of the Columbia river to the Arctic Ocean and among the primitive peoples of Northeastern Asia go far to prove the existence of what may be called 'the Bering Sea culture,' if not indeed 'the Bering Sea race'—physical characters, social phenomena, myths and legends, languages even, showing such resemblances of a general, and sometimes of a particular, nature, as to suggest long-continued interrelations in similar environments leading to the production on a rude and crude scale of what is seen in much higher development in the phenomena accompany-

ing the rise of the 'Mediterranean race' and the evolution and expansion of its wonderful civilization. As 'local' races some would recognize the Eskimo, by reason of their differences alike from the Asiatic peoples and the American Indians, and their possession of a unitary culture; the Bushmen and the Hottentots of South Africa, although many regard the former as remnants of the earliest known population of the Dark Continent; the Veddas of Ceylon, and perhaps some of the other very primitive peoples of India and the adjacent islands; the Negritos of the Philippines; the Ainu of Japan, etc. But in several of these cases it is clearly difficult to distinguish between the remnants of a race once more numerous and widely distributed and a 'new' race produced by modification *in situ*. Moreover, 'culture-races' and 'physical types' are not necessarily contemporary and coterminous. In addition to 'local' races, there may be much smaller ethnic phenomena, which may be designated 'local varieties,' or 'local types,' needing but the necessary encouragement of environment, etc., to develop into 'local races.' Indications of such are to be found among the American Indians, the Negroes of Africa, the Mongolian tribes of Siberia, the Malayo-Polynesians, etc. In prehistoric Europe also 'local' races and 'local varieties' existed.

Physical Criteria of Race.—The designation of the chief varieties of man as the *White* (Aryan-Semite), *Yellow* (Mongolian), *Brown* (Malay-Polynesian), *Red* (American Indian), and *Black* (African Negro, etc.) races still holds as a more or less ready and useful classification, although the terms 'white,' 'yellow,' 'brown,' 'red,' and 'black' can be employed in no absolute sense, since there are tribes of American Indians, who are quite 'white' and that, too, not from European intermixture; 'whites' who are rather 'black'; and Africans who are properly 'yellow' (with no Mongolian element). Nor are all Mongolians 'yellow' or all Malays and Polynesians 'brown.' Indeed 'dark' and 'light' varieties may be found in all the human races, even among the African Negroes, where not alone 'yellow men' occur, but a 'ruddy' type is also met with. Deniker distinguishes ten shades of color or pigmentation of the human skin: (1) pale white, (2) rosy or florid, (3) brownish-white, (4) yellowish-white of rather sickly hue, (5) olive-yellow, (6) dark yellow-brown (dark olive, the color of dead leaves), (7) red or copper-colored, (8) reddish-brown or chocolate, (9) sooty black, (10) coal-black. Of these the first three are readily recognizable among the whites and the last four among the blacks. As inspection of any individual will show at once, the pigmentation is not at all evenly distributed all over the body in any single race, certain older and more general

evolutional considerations determining, perhaps, deeper color, or the opposite, here and there, while clothing, exposure to the air and water, etc., have their effects. Stories of whole races or tribes turning black or white (e.g., the 'black Jews' of Malabar, who were certainly 'black' before they were Jews) may be dismissed as mere fiction. The so-called 'Mongolian spots' in young children, once thought to be absolute indications of Mongolian blood, have now been reported from practically all the human races, and can no longer be regarded as a racial test, being rather relics of an older general human phenomenon. So, too, in all probability, with a number of other physical 'marks' still considered to be racial criteria, or identified with one race alone. An interesting ethnological fact is that new-born children among the Negro races are of 'a reddish-chocolate or copper color (Deniker)' turning darker in three or four days; Mongolian children much less yellow at birth; Japanese are said to be 'rosy'; while the children of most European peoples are very often born with blue eyes, and hair much lighter than that of adults. While color of skin and nature of hair are not always absolutely correlated, a general correspondence may practically be recognized. Thus, according to Deniker: To the white coloring of the skin corresponds in general fashion, wavy hair varying in color with those of eyes and skin (white, fair, brown races); to ellow corresponds straight and smooth hair; to reddish-brown frizzly hair; to black 'wooly' hair. In many races, women resemble children in having clearer skin and lighter hair than men. Several systems of race-classifications have been based upon the hair, and brunettism and blondism have l en correlated by some authorities with certain aspects of human progress and civilization, the difficulty however, has always been to determine which type was characteristic of the earliest men of prehistoric Europe, the truth being, in all probability that both varieties are very old in the Eurafrican area. There is a pathological aspect to the pigmentation of the body, color of hair, etc. Sun-burn, for example, reddens painfully the skin of the fair European races, while it bronzes merely that of the darker varieties of the Mediterranean area; and red hair of all sorts is very commonly accompanied by freckles. Interesting anomalies are albinism (e.g., among Negroes) and erythrism (among European Jews), both known now to occur in several human races.

Of other physical characters most attention has been given perhaps to *stature* and to the *form of the head*, which still figure largely in ethnological classifications, the last in particular by reason of the correlation suggested between head (brain) and intelligence. Some of the chief facts and theories are as follows:

(1). *Stature.*—The height of the human body is in itself no exact criterion of intelligence, for stature does not seem in any wise to run parallel with the development of culture. If, e.g., the human race is divided, as Deniker does, into the following four classes: *Low statures* (under 63 inches, or 1 m. 60); *statures below the average* (or from 63 to 65 inches, from 1 m. 60 to 1 m. 649); *statures above the average* (from 65 to 67 inches, from 1 m. 65 to 1 m. 699); and *high statures* (67 inches and upwards, or from 1 m. 70 upwards), it is found that in the group of high statures, along with the representatives of various European nations (certain Scandinavians, English, Scotch, etc., in particular) will be found also Polynesians, several West African Negro tribes and many American Indian peoples, such as the Iroquois, several Ojibwa and Siouan tribes, the Patagonians, western Eskimo, etc., while the majority of mankind, civilized and uncivilized alike, are somewhat undistinguished, being neither high nor low. Into the class of low statures fall the Japanese (to a large extent) with several of the more or less civilized peoples of Farther India such as the Annamese, etc.; likewise the Peruvians, creators of one of the cultures of prehistoric America. The range of human stature in its normal variations is from 4 ft. 1 in. to 6 ft. 6¾ in. (Deniker), from 4 ft. 7 in. to 6 ft. 2 in. (Keane),—a variation of about 2 ft., the average stature being calculated by Keane at about 5½ ft. and Deniker at about 5 ft. 3 in. Ripley estimates that 'on the whole considerably more than 99 per cent. of the human species is above the average height of 5 ft. 1 in.; Daffner, a German writer on the growth of the body, applies the term 'dwarf' to all adults below 4 ft. 7 in., which is about the height of a boy of 11 years, and Deniker makes dwarfish those below 4 ft. 1 in. The average height of known ethnic groups runs, e.g., from about 4 ft. with certain African Negrillos to nearly 6 ft. with the Scotchmen of Galloway. If one includes individual dwarfs and giants in the calculation, the range of human stature goes all the way from the 15 in. of the little Sinai woman, Milany Agyba, to the 9 ft. 5 in. attributed to the Finnish giant Caianus. Tribes and peoples of short stature, as e.g., the Ainu of Japan, the Veddas of Ceylon, and probably also the Bushmen of South Africa (some of these have been stunted by their recent environment) are not properly 'pigmies,' that term applying properly only to certain peoples whose height is notoriously low, such as some of the so-called 'Pigmies' of Central Africa, etc., whose stature often descends much below 4 ft. The discovery a few years ago in various parts of Central and Southern Europe of the remains of many groups of individuals of small stature in prehistoric burial-places of great age, added

to the fact known long before of the existence in parts of Italy, Sicily, etc., of very many individuals of small body-height, who are normally so, and not to be confused with the pathological cretins of Switzerland, has given rise to an interesting theory as to the physical constitution of the earliest representatives of the human race. Kollmann, the famous anatomist of Basel, holds that there is evidence enough to prove the present, or former, existence in all quarters of the globe of small-statured and taller races alongside each other (for example, the African pigmies and the tall Negroes; the primitive peoples of Celebes, etc., and the tall Malayo-Polynesians; the Veddas of Ceylon and the taller populations of parts of southern Asia; the prehistoric and modern whites of dwarfish stature and the white race, etc.). Of these two parallel races Kollmann considers the 'pigmoid,' or small-statured, to be the original and more primitive, all the peoples of tall stature having been evolved in course of time from the short-statured. Thus the original stock of the human race was 'pigmoid,' and in the first ages of man's existence there were no giants in the land. This physical peculiarity of the earliest men may be repeated ontogenetically in the long-continued small-stature of the individual child. Certain writers (Gomme, MacRitchie, etc.) explain the prominence of dwarfs and the like in folk-lore and fairy-tale as the result of the contact of the higher-statured and now civilized races of the Old World with previously existing pigmoid and small-statured races, now extinct. There is, doubtless, not a little truth in these theories, though it has not yet been satisfactorily proved that the first human beings were pigmies. Other interesting points about human stature, are its variations according to season (greatest growth in young persons in spring), environment (higher stature of the well-fed and well-to-do; urban and rural differences), and the generally shorter stature of women as compared with men *en masse* (the difference averages about 5 in.). The stature of races represented only by their bony remains is calculated from measurements of the long bones.

(2) *Head-form.*—Many ethnologists still attach much importance to the form of the head as a criterion of race. The chief test in this matter is what is termed the 'cephalic index, i.e., the relation between the greatest breadth and the greatest length of the head (or skull), the latter being taken as 100. When this relation is 75 and under skulls are called 'dolichocephalic' (Gk. 'long-headed'); 'mesocephaic' or 'mesaticephalic' (Gk. 'medium-headed'), when the relation is in the neighborhood of 80 (from about 78 to 82); and 'brachycephalic' (Gk. 'broad-headed'), when it is around 85 (from about 83 on). Skulls ap-

proaching the dolichocephalic in index are termed 'sub-dolichocephalic,' and those approaching the brachycephalic 'sub-brachycephalic'; exceedingly dolichocephalic skulls are called 'hyper-dolichocephalic' and very brachycephalic 'hyper-brachycephalic.' Some craniologists adopt this rather convenient notation: Hyper-dolichocephalic (under 70), dolichocephalic (from 70 to 75), sub-dolichocephalic (from 75 to 78), mesocephalic (from 78 to 80), sub-brachycephalic (from 80 to 83) brachycephalic (from 83 to 85), hyper-brachycephalic (from 85 to 90), ultra-brachycephalic (from 90 up). Artificial deformations of the head in vogue in various parts of the world (ancient Peru, modern Flathead Indians; Tolouse in s.w. France, etc.) in modern and in prehistoric times, disturb, of course, the cephalic index, producing for example ultra-brachycephaly, etc. The normal range of the cephalic index Keane estimates at from 61.9 (in a Fijian skull) to 98.21 (in a Mongolian). The cephalic index in the living subject is about two units higher than that of the skull for the same individual. The differences in index according to sex, Deniker estimates, do not exceed on the average one unit; women as a rule being somewhat more brachycephalic than men. The head has already assumed its definite form in the individual during childhood (i.e. at the period of from 10 to 15 years, with certain variations according to race). When the distribution of the cephalic indexes among the races of man is examined it appears that dolichocephaly, brachycephaly, etc., are better perhaps as classifiers of the varieties within a single race than as delimiters of the white, black, yellow, etc., stocks, the one against the other. It is now known that both dolichocephalic and brachycephalic types of skulls are to be found in all the races, Caucasian, Mongolian, Malay, American Indian, Negro, the American Indians and Caucasians being especially notable for the variety of skull-forms occurring within the limits of the race. The Mongolian race was once thought to be entirely brachycephalic, but many northern Chinese, Japanese, etc., are dolichocephalic, while numerous representatives of the race in various parts of the Mongolian area are mesocephalic. The Negroes were once, in like manner, thought to be altogether dolichocephalic, but some West African Negroes, the Andamanese and many other Negritos are brachycephalic; indeed the typical Negritos may be said to be brachycephalous. Equally incorrect is the assertion that all prehistoric races are dolichocephalic, for brachycephalic skulls of very ancient date are now known from various parts of Europe, etc. According to one theory, the civilization of ancient Europe was due to indigenous dolichocephals, while another attributes its chief features to immigrant brachycephals. It is now certain, however, that the Aryans originated in Europe and not in Asia, and that the culture of

the Mediterranean area was more European than Asiatic in many of its aspects. These facts tend to minimize the importance of head-form *per se* in relation to culture, mixture of races being in all probability more significant than physical peculiarities of the kind in question. Other physical characters of which use has been made as race-criteria are the shape of the nose, prognathism (facial angles, etc.) of the maxillary portion of the face, the shape of the face (long, short, medium), measurements of the curve of the head, shape of the pelvis, shoulder-blade, etc., length of the long bones, etc. Some of these, however, vary so much individually as to be of comparatively little value as race-distinctions and prognathism and the facial angles are by no means esteemed by anthropologists as they were a quarter of a century ago. While the various portions of the body of man and his external and internal organs present certain racial peculiarities (Mongolian eye, Bushman steatopygia, Inca bone, etc.), the proportions of the body in the living subject, as Deniker points out do not show such marked and constant racial variations as to make them absolute race-criteria. The study of the brain among the races of man is hardly begun in some parts of the world, and this fact, added to the enormous differences in the constitution (weight, convolutions, etc.) among individuals of the same race, together with the influence of stature, weight, etc., make the use of the characteristics of the brain as a measure of race a matter of great difficulty. In the higher associational centers of the brain, however, investigators look for distinguishing features in races of genius, as in men of genius.

Psychic Criteria of Race.—While languages and systems of writing differ so much in all parts of the globe, it is interesting to note that all races of men (particularly in their individual childhood) show capacity for acquiring the speech of another race,—children of English parents born in China will readily learn to speak the language of the country, and a Hottentot child in South Africa will be able to speak English with considerable fluency. Writing in the English script is often rapidly acquired by the children of primitive peoples; and to a great extent reading also. Oratory in the English language has been highly cultivated by many individuals belonging to other than the white race (American Indians, African Negroes, Chinese, Japanese, and more recently, Filipinos). The precocity of children of savage and barbarous tribes in the schools established by the whites is well-known, and the 'falling away' in later years of life is due more to the absence of proper environmental stimuli than to the essential lack of intellectual capacity. The relapses are due to the fact that the primitive individuals, trained under civilized auspices, when left to themselves, do the human thing (i.e., return to their own people) rather

than fall in with the artificialities of modern culture. The beginnings of most of the social and educational institutions of to-day are to be found among primitive peoples. From the various sorts of 'prophets,' 'medicine men,' etc., came the clergyman, the teacher, and the other professions of a similar character; the influences of the division of labor according to sex are still perceptible in the alignments of modern society; the 'bachelors' houses' and the 'women's houses,' of certain Indo-Pacific and American Indian peoples, have their representatives in our men's clubs and women's clubs at the present time; the village-houses of the Alaskan and other Eskimo peoples were the forerunners of municipal theaters and play-houses; the Mumbo-jumbo systems of West African Negroes anticipate many features of our modern police and other social protective devices; federal systems of government had typical antecedents in the League of the Iroquois associated with the name of Hiawatha, who likewise anticipated the Hague Conference and its deliberations; the history of the market-system among the Negroes of Africa involves the consideration of the chief problems of taxation, jurisprudence and civic life not discussed among civilized communities. The history of morals and religion shows that few, if any great problems exist, which did not begin far back in barbarism or savagery, or at least in the ancient civilization of primitive peoples such, e.g., as the American Indians. The old Peruvians touched upon monotheism and the still existing Veddas of Ceylon are confirmed monogamists. If one eliminates the influences of environment, in comparing one age with another, the absolute exercise of intellect is not so markedly greater with civilized than with uncivilized races. The utilization of the cocoanut-tree, the bamboo, the oil-palm, etc., among primitive peoples is as thorough-going as is that of electricity, alcohol, gas, or the like, among the higher races, and the rude tribes of California have perfected basketry beyond anything known elsewhere in the world. Many attempts have been made to distinguish the various 'epochs' or 'stages' of human culture, the most prevalent being that which recognizes in succession (1) hunting, (2) pastoral (nomadic shepherd), (3) agricultural; and that which divides the stages of human progress into (1) savagery, (2) barbarism, (3) civilization. But, since agriculture, in our sense of the term, is connected with the use of such domestic animals as the horse, the cow, etc., and civilizations like those of ancient America arose without these adjuncts, the so-called 'hoe-culture' of primitive peoples must be given a more important rôle than is generally assigned to it. The lines between savagery and barbarism, and between barbarism and civilization, are often very uncertain; and, in general, the attempt to construct a series of 'stages' or 'culture epochs' through which every human race

has passed, or must pass, has not been altogether successful. If one takes the American Indians, for example, it will be found that this single stock represents all known grades of culture, with the exception of the highest forms developed in Europe, Africa and Asia with the aid of domestic animals, ranging from the savagery of the Seri of the Gulf of California to the 'civilization' of the Aztecs, Mayas and Peruvians. In ancient America we also see the great importance of irrigation in arid areas as a stimulus of agriculture and a developer of the foundations of human civilization. Some authorities, like Bos, would rather classify human industries in some such way as the following: (1) collectional (merely gathering, picking, etc.), (2) productive (man assisting nature), (3) transformative (arts, manufacturers), (4) locomotive (trade, commerce). Of considerable importance are the 'social' types of regional or environmental character, such as those of France recently studied by Demolins, in which the chief factors are the nature of the place and of the labor performed,—there are pastoral types, viticultural types, chestnut-culture and olive-culture types, etc., all within a comparatively limited area. The origin and development of these 'types' suggest much of interest in connection with the larger question of the origin and development of the diverse forms of human civilization.

Classification of Human Races.—As a practical classification of the various human races now existing the following geographical-ethnological scheme may serve:

I. Eurafrican Races. (1) The 'European race or Northern race, *the* white race (fair, dolichocephalic, tall), characteristically represented by the 'Germanic' peoples, and having as a sub-race a fair, mesocephalic tall variety found in parts of western and northern Russia, northern Germany and western Norway. (2) 'Eastern race' (fair, tall, sub-brachycephalic), found chiefly in eastern Europe, and having as a sub-race a fair, mesocephalic, short variety chiefly noticeable in the region of the Vistula among the Poles, etc. (3) 'Western race' or 'Alpine race,' characteristically found in the western Alps, the central plateau of France, etc., by some termed also 'Celtic'—dark, very brachycephalic, short. (4) 'Mediterranean race,' including many peoples, ancient and modern, of the littoral, islands and basin of the Mediterranean. The term may be elastic enough perhaps to comprehend the 'Ibero-Insular' race (dark dolichocephalic, short) of Deniker, and his 'Atlanto-Mediterranean' or 'Littoral' race (dark, mesocephalic, tall) with its sub-race, the 'Northwestern' (tall, sub-dolichocephalic, with chestnut, often almost brown hair) found chiefly in the northwest of Ireland and eastern Belgium; likewise his so-called 'Adriatic' or 'Dinaric race (dark, brachycephalic, tall), with its sub-race, shorter, less brachycephalic, with lighter hair and eyes. (5) Of the non-

Aryan peoples of Europe, the Basques belong with the 'Mediterranean race.' The Magyars of Hungary and certain portions of the population of the Balkan peninsula (though now very mixed and betraying such connection chiefly by language) are immigrants of Turkic stock from Central Asia; in northern Scandinavia and scattered over many parts of Russia are many peoples of Finno-Ugrian stock, such as Lapps, Finns (like the Turks chiefly affined by speech, otherwise largely 'Aryanized'), Votiaks, Permians, Cheremiss, Mordvins, Ostiaks, etc. Other immigrant and migratory peoples in Europe are the Jews (Semitic), Armenians (Aryan), Gipsies, etc. For such peoples as have come under the influence of both western Asia and eastern Europe, the convenient term 'Eurasian' has been suggested. This may be applied, on the one hand, to the rather modern wander-folks (e.g., the Armenians, Jews, Gipsies, etc.) or, on the other, to the Magyars, Finns, etc., who have practically become European nationalities and are developing aspects of European culture. In ancient times, also 'Eurasian' might well apply to the phenomena involved in the relations of Asia Minor and eastern Europe, as revealed by the archæological discoveries of the last ten years.

II. Asiatic Races. (1) The 'Asiatic,' yellow, or Mongolian race, including as varieties, distinguished often more by linguistic and cultural features than by physical peculiarities the Siberian (Samoyeds, Ostiaks, Tubas, etc.), with its European off-shoots; the Tungus-Manchus; the Turko-Tartans; the Mongols proper; Tibetans; the Chinese-Corean-Japanese; the Indo-Chinese (in part). The Mongolian race has probably several physical 'sub-races,' and several sections of it, like the modern Japanese, are now very mixed. (2) 'Palæasiatic race,' the peoples of extreme northeastern Asia (Chukchee, Koriaks, Kamchadals, Yukaghirs, etc.), some of whom show possible relationship with certain North American Indians. (3) The Ainu of Japan and the Kuriles, possibly a sub-variety of the Caucasian or white race, formerly much more widely distributed in Asia. With the Ainu may belong possibly such peoples as the Giliak (in part) and some of the 'aboriginal' tribes of western and southern China. (4) Certain aboriginal peoples of China, Indo-China, such as the Miao-tse, Mois, Kuis, Mons, Khmers, etc., who may be related to the Mongolian, or, in part, to the Caucasian stock. Others of the so-called 'aboriginal' stocks of this region are probably related to the Malay race and the so-called 'Indonesians' (e.g., the Khiams); others still to the non-Aryan and non-Mongolian races of Hindustan. (5) The Dravidian race, including the Dravidas proper (Tamuls, Telugus, Kanarese, Malayalas, Tulus, and many uncivilized tribes of the hills and plateaus) and the (Maler, Oraons, Gonds, Khonds, etc.) and the Kolarians or Munda-Kols (Mundas, Kols

Juang, Santals, Bhils, etc.) As a subrace of this stock may possibly be counted the Todas of the Nilghiri Hills to whom some attribute Caucasoid affinities (cf. the Ainu of Japan). (6) Vedda race, now surviving in Ceylon only, but formerly much more widely distributed and representing originally a very primitive type of mankind. (7) Malay race still represented in the peninsula of Malacca, but having its great extension outside of the continent in the Indo-Pacific islands. Some ethnologists regard the Malay race as merely a variety of the Mongolian race. (8) Negrito and Negritoid peoples of southeastern Asia (Sakai, etc., of the interior of Malacca, Andamanese or Minkopis of the Andaman Islands in the Bay of Bengal, etc.) (9) Aryan race, largely represented in Hindustan, Central Asia and Asia Minor (Hindus, Afghans, Baluchis, Persians, Turkomans in part, tribes of the Pamir, Kurds, Armenians, etc.) all originally intruders into Asia from Aryan Europe. (10) Semitic race (Arabs, Jews, Assyro-Babylonians of ancient times) probably intruders from Africa as the existence in the northeastern part of that continent of peoples of Semitic stock seems to indicate. (11) Gipsies, a wander-folk of rather uncertain origin and mixed stock (but linguistically Aryan). (12) American race, represented by the Eskimo of extreme n.e. Asia.

III. Indo-Pacific Races. (1) The Malay, Malayo-Polynesian, or brown race, including all the brown peoples of the East Indian Archipelago (Malayan tribes of Sumatra, Java, Borneo, the Philippines, Celebes and the smaller islands, Formosa, etc.), and all the non-black inhabitants of the island-world of the Pacific (Polynesians, Micronesians, etc.), though some are probably mixed with the other stocks of the western part of this region. Some authorities recognize in this area an Indonesian race more Caucasoid than the Malay-Polynesian, but this seems unnecessary. (2) Certain very primitive peoples of Celebes and some others of the East Indian Islands, such as the Toala, etc., may perhaps be classed by themselves as representing a proto-Malayan, if not a pre-Malayan race. (3) The Negritoes of the Philippines, etc. (4) Melanesian race, with two varieties, the Papuans of New Guinea and the coastal islands, and the Melanesians proper (taller and more dolichocephalic than the Papuans) inhabiting the Admiralty Islands, New Britain, Solomon Islands, New Hebrides, Loyalty and Fiji Islands, etc. (5) Australian race, including all the Australian blacks and the Tasmanians (now extinct). Many ethnologists connect the Australians in some way with the Dravidians of southern Hindustan.

IV. African Races. (1) The African or Negro race, the characteristic people of the largest section of the continent, including (a) the Negroes proper. (2) The Bantu tribes (of special importance in the southern

division,—Zulu-Kafirs, Bechuana, Herrero, etc.), both scattered over wide areas and embracing perhaps several sub-varieties distinguishable by certain physical peculiarities. (3) 'Pigmies,' or so-called 'Negrillos,' a dwarf-like black race extending practically across the continent in a narrow zone along the Equator from Uganda to the Gaboon (Deniker), though their former distribution was formerly much greater. These pigmies include the Akkasor, Tikitikis, Afifi, Wambutti, Batwa, Babongo, Akwa, etc. They form a most interesting and very primitive race of man. (4) Bushmen. This small-statured race of South Africa (the Kalahari desert in particular) is a 'black' (or rather 'yellow') people with certain physical characters which justify their classification by themselves as a very primitive stock, once widespread over Africa, as some think, and forming, according to Petrie, the earliest stratum of the population of ancient Egypt. With the Bushmen Deniker classes also the (5) Hottentots, who are by some ethnologists ranked as a separate race. (6) Semitic race, represented in Africa by the Abyssinians, etc. (in part), and also by a large infusion of Semitic blood in northern and northeastern Africa resulting from invasions from time to time from the Arabian peninsula. The original home of the Semites was probably somewhere in north or northeastern Africa, whence the overflow into Asia took place. (7) 'Mediterranean race,' represented to-day very largely in the so-called 'Hamitic' peoples of the northern part of Africa, Berbers, 'Moors,' Egyptians, past and present, etc. (8) Mixed races of northern and northeastern Africa, including many of the so-called 'Hamitic' peoples, certain 'Ethiopian' peoples, the dominant strain being sometimes 'Mediterranean,' sometimes Semitic, sometimes Negro. (9) Malay. In the great island of Madagascar are to be found the Hovas and some other smaller peoples, whose language (Malagasy, etc.), proves them to be immigrants (the invasion occurred probably 900 years ago) of the Malayo-Polynesian stock.

V. American Races. (1) The 'American' or so-called 'Red race,' occupying all parts of the continent at the time of the Columbian discovery, except the extreme north of North America, where dwell the Eskimo (extending over into n.e. Asia), regarded by some authorities a mere variety of the American Indian, but by others as (2) a second American race. Besides these the American continent contains its millions of the white (all varieties) and black races, besides Chinese, Japanese (representing the Mongolian stock), —all immigrants since the Columbian Discovery. *Bibliography.*—For references in Ethnology see the list of works given under Anthropology, particularly Brinton's *Races and Peoples*, Deniker's *Races of Man*, Keane's *Ethnology*, Ratzel's *History of Mankind.*

ETHOLOGY, n. *ĕth-ŏl′ŏ-jĭ* [Gr. *ĕthos*, use, disposition, or character formed by habit; *logos*, discourse]: the science which determines the kind of character produced in conformity to certain general laws, or by any set of circumstances, physical and moral; the theory of the causes which determine the type of character belonging to a people, or to an age. ETHOLOGICAL, a. *ĕth′ō-lŏj′ĭ-kăl*, connected with or relating to ethology. ETHOL′OGIST, n. *-jĭst*, one versed in ETHOLOGY.

ETHULIA, n. *ē-thū′lĭ-a* [etym. doubtful]: in *bot.*, typical genus of the sub-tribe *Ethulieæ*.

ETHOS: a term applied to the dominant moral practices and beliefs of any group of peoples, especially of tribes or nations. In distinction from custom it emphasizes the inner purposes and intentions as over against the overt external acts.

ETHUSA, n. *ē-thū′za* [Gr. *aithussō*, I put in rapid motion; I kindle]: genus of brachyurous short-tailed crustaceans: example, *Ethusa mascarone*.

ETHYL, n. [from *ether*, and Gr. *ūlē*, the matter from which a thing is made]: (symbol C_2H_5), the organic radical contained in many carbon compounds, but which cannot exist in the free state. Its most important compounds are the ordinary ether, the oxide of ethyl, and alcohol, the hydrate. The iodide C_2H_5I is also of much importance in synthetic chemistry.

ETHYLAMINE, *ĕth″ĭlăm″ĭn*: a compound in which one or more of the hydrogen atoms of ammonia, NH_3, is replaced by the radical ethyl, C_2H_5. Three compounds of this sort are possible, and all have been actually prepared. When only one of the hydrogen atoms of the ammonia has been replaced, the resulting compound, $NH_2C_2H_5$, is known as mono-ethylamine, or ethyl monamine; and it is this substance which is understood when the word ethylamine is used without qualification. $NH.(C_2H_5)_2$ is known as diethylamine, and $N.(C_2H_5)_3$ is called triethylamine. All three are formed when absolute alcohol is heated with zinc chloride, in closed tubes, to 500° F.; and they may then be separated by the crystallization of their picrates. All three of the ethylamines are alkaline, all smell of ammonia, and all combine with acids to form salts. The monoamine is a colorless, inflammable liquid, having a specific gravity of 0.70, boiling at 68° F., and not solidifying at 220° below zero, F. Diethylamine is also volatile, colorless, and inflammable, with a specific gravity of 0.72, and boils at 133° F., under ordinary atmospheric pressure. Triethylamine is very similar to the other two in general character. It has a specific gravity of 0.73, and boils at 194° F. Triethylamine is but slightly soluble in water; diethylamine dissolves in water freely; mono-ethylamine mixes with water with a considerable rise of temperature, and the probable formation of a hydrate; though it is entirely expelled again, upon boiling.

ETHYLATION: in chemistry, the replacement (sub-

stitution) of hydrogen or some other element by the ethyl group or radical $CH_3C_1H_2$ (q.v.).

ETHYL BROMIDE, CH_3CH_2Br: colorless, mobile liquid boiling at 38°.4C. It is prepared by the action of bromine on a mixture of red phosphorus and alcohol and is largely used in organic chemistry for ethylation purposes (q.v.).

ETHYLENE, *ĕth'ĕlēn*: a gaseous hydrocarbon having the formula C_2H_4, and constituting the first member of the olefine series. It is formed in the dry distillation of numerous organic bodies, but is most conveniently prepared for laboratory purposes by mixing 1 part of alcohol with 4 parts of sulphuric acid, adding enough sand to form a paste, and heating the mass over a flame. The sand takes no part in the chemistry of the process, but merely serves to regulate the action. Ethelyne is a colorless gas, which burns with a bright flame, it may be condensed to a transparent liquid which freezes at 272° F. below zero. Mixed with three times its own volume of oxygen, and fired by a spark, ethylene explodes with great violence. When it is mixed with chlorine in the dark, combination takes place according to the formula $C_2H_4+2Cl=C_2H_4Cl_2$, the new substance being an oily fluid, known as ethylene dichloride, or 'Dutch liquid.' It is on account of this reaction that ethylene was formerly called 'olefiant' (or 'oil-forming') gas.

ETHYLIDENE: the bivalent, hypothetical organic radical, $CH_3\overset{|}{C}H$. Its best known compound is ethylidene chloride, $CH_3\overset{|}{C}HCl_2$, but many other derivatives of it have been prepared.

ETHYLIDENE CHLORIDE, CH_3CHCl_2: colorless, mobile liquid with an odor resembling that of chloroform. It boils at 57°.7C.. is sometimes used as an anæsthetic and is formed by the action of phosphorous pentachloride on aldehyde. Commercially it is obtained as a by-product in the manufacture of chloral (q.v.).

ETHYL IODIDE, CH_3CH_2I: colorless, highly refractive liquid which speedily becomes colored brown, from the liberation of iodine, on exposure to light or air. It boils at 72°C., is prepared by adding iodine to a mixture of alcohol and red phosphorus and is largely used as a synthetic agent in organic chemistry for the purpose of ethylation (q.v.).

ETHYL NITRATE, $CH_3CH_2ONO_2$: colorless liquid with a pleasant smell, prepared by distilling a mixture of alcohol and nitric acid together with a little urea to decompose nitrous acid. It boils at 86°C., is contained in 'sweet spirits of nitre' and, when quickly heated, explodes. Chemically its chief interest is in the fact that it bears the same relationship to alcohol that 'nitroglycerin' and gun cotton do to glycerin and cotton, respectively. Ethyl Nitrate is sometimes called, incorrectly, 'nitric ether.'

ETIENNE, St. *săngt ā-tē-ĕn′:* important manufacturing town of France, dept. of Loire; on both banks of the Furens, an affluent of the Loire, in the centre of a valuable and extensive coal-field, 30 m. s.s.w. of Lyon by rail, about 288 m. s.s.e. of Paris. It is surrounded by coal-mines, is seated upon coal-deposits, and has galleries driven even beneath its streets. The stream on which the town is built furnishes invaluable water-power to move its machinery, and its waters are also of great use for tempering iron and steel. The old town of St. Etienne is badly built, and the new town, which has sprung up very quickly, is destitute of architectural harmony. The newer houses are built of a fine white sandstone, and are frequently five and six stories in height; but they rapidly become tarnished and begrimed by the perpetual cloud of coal-smoke which hangs over the town. The most note-worthy building is the Hôtel-de-Ville, which contains the *Musée Industriel,* with specimens of the manufactures of the town, and of the minerals and fossils of the neighborhood. St. Etienne is famous for manufactures of ribbons and firearms. The ribbon manufactories contain 30,000 looms, and the annual value of their produce is estimated at 60,000,000 francs ($11,518,750) in value. They are unrivalled in elegance of design, and in richness and delicacy of color, and are exported to all parts of the world There are extensive private manufactories of firearms besides an imperial firearms manufactory, which supplies most of the muskets of the French army. St. Etienne has also extensive manufactures of bayonets, scythes, nails, sawblades, foils, anvils, vises, files; also of silks, velvets, lace, embroidery, muslins, glass, leather, and paper. From the coal-field on which St. Etienne is situated, about 600,000 tons of coal are raised annually. On 1866, Jan. 1, St. Etienne was constituted cap. of the dept. St. Etienne arose originally from a castle built in the 10th c. by the Counts of Forez. It increased greatly in the 15th c. Pop. (1901) 146,559.

ETIOLATE, v. *ē′tĭ-ō-lāt′* [F. *étioler,* in *gardening,* to grow up long-shanked and colorless]: to whiten by excluding the light of the sun; to blanch; to become white. E′TIOLATING, imp. E′TIOLATED, pp.: Adj. applied to the whitening of the leaves and the lengthening of the stem of a plant by its being suffered to grow in a shady or dark situation. E′TIOLA′TION, n. *-lā′shŭn,* the act of becoming white by the absence of light; absence of green color, the process of blanching plants by excluding the action of light.

ETIOLOGY, or Ætiology, n. *ē′tĭ-ŏl′ŏ-jĭ* [F. *étiologie*—from Gr. *aitĭa,* a cause; *logos,* a discourse]: the doctrine of causes, particularly with reference to diseases; the science of the origin and development of things. E′TIOLOG′ICAL, a. *-lŏj′ĭ-kăl,* connected with or related to etiology.

ETIOTIN, n. *ē′tĭ-o-tĭn:* in *chem.,* yellow coloring matter, found in plants which have grown in the dark.

ETIQUETTE, n. *ĕt'ĭ-kĕt'* [F. *étiquette*, a ticket on which the forms to be observed on particular occasions were inscribed]: forms of civility, manners or good breeding; the ceremonial code of polite society. Originally, etiquette signified a little piece of paper affixed to a bag or other object to signify its contents. The word came probably to possess the secondary meaning which we now attach to it, of the forms or decorums observed in the intercourse of life, particularly on state occasions, from its having been customary to deliver such tickets, instructing each person who was to take part in the ceremony as to the part which he was expected to take.

ETIVE, *ĕt'ĭv*: sea-loch in the n. of Argyleshire, Scotland, extending inland from the Firth of Lorn, 20 m. e. and n.e., with a breadth of a quarter of a mile to three m. It is bordered by granite in its upper part, and by trap in its lower. Near its mouth, there is mica-slate on the n. side, and Permian strata on the south.

ETNA, or ÆTNA, *ĕt'nâ* (now MONTE GIBELLO): largest volcano in Europe. It is an isolated mountain, on the coast of Sicily, and cut off from the chain of mountains parallel with the n. shore of the island, by a small valley through which flows the Alcantara, and from the s. chain by a larger valley, which forms the basin of the Giaretta. Its e. side rises directly from the Mediterranean, 30 m. of coast being formed by the streams of its lavas. Its base is almost 90 m. in circumference, and from this it rises like an immense cone to the height of 10,874 feet.

The history of Etna does not carry us far back geologically; an active volcano in the later portion of the Tertiary period, it continues still to pour forth materials; and the ejected ashes, dust, and lapilli, together with the streams of molten lava, have, in the course of untold ages, built up this immense mountain. One central crater has been the prevailing outlet for these materials, and they have consequently arranged themselves into one central and dominant mound—the cone-shaped Etna; but innumerable secondary and surrounding craters, each forming, by its ejected matter, an external smaller cone, exist on Etna. Many of these, in the increase of the mountain, have been covered and hid by the more recent eruptions. But the most remarkable feature in Etna is the Val del Bove, an immense gully excavating the eastern flank of the mountain, five m. across, and surrounded by nearly vertical precipices 1,000 to 5,000 ft. high, on which are shown sections of innumerable lava-streams and beds of scoriæ, traversed by highly inclined dikes.

The summit of Etna rises considerably above the line of vegetation, and consequently presents, except where covered with snow, a dreary waste of black lava, scoriæ, and ashes, in the centre of which, in a desolate plain, rises the crater-bearing cone. This is called the Desert region. It is followed by six or seven m. of the Woody region.

The first recorded eruption of Etna took place B. C. 476. The most remarkable that have occurred since are the following: A. D. 1169, when Catania and 15,000 of its inhabitants were destroyed; 1527, in which two villages and many human beings perished; the eruption which continued at intervals 1664–73, and destroyed many villages with their inhabitants. Numerous chasms were formed at this time; from one several miles long and four or five ft. wide were emitted a bright light and strong sulphurous vapor; from another, black smoke and quantities of stones were given out; and from others, streams of lava. In 1673, an immense volume of salt (?) water rushed down the mountain: by some, it is supposed to have been ejected from the crater, but it is more probable that it arose from the sudden melting of the snows which covered the summit of the mountain. A very great eruption took place 1852. Immense clouds of ash gray dust were ejected. From two new mouths on the eastern flank there issued vast torrents of lava, one of which was two m. broad, and at one time as much as 170 ft. deep. The next outbreak, 1864–5, was not important. That of 1879, May, was much more violent; the clouds of smoke and showers of ashes and scoriæ being followed by the ejection of a torrent of lava 200 to 300 ft. in width which desolated a large tract of highly cultivated land.

ETOLIA. See ÆTOLIA.

ETON, *ē'ton*: town in the s. of Buckinghamshire, England, on the left bank of the Thames, 42 m. s.s.e. of Buckingham, 22 m. w.s.w. of London, near the Slough station of the Great Western railway. It lies opposite to Windsor, in Berkshire, with which it is connected by bridge over the Thames. Though in separate counties, these two towns really form one. Pop., exclusive of the Eton boys, 3,300.

ETON COLLEGE: one of the most famous educational establishments in England; founded 1440 by Henry VI., under the title of 'The College of the Blessed Mary of Eton beside Windsor.' The original foundation consisted of a provost, 10 priests, 4 clerks, 6 choristers, 25 poor grammar scholars, a master, and 25 poor infirm men. The king provided for the establishment out of his own demesne lands and the estates of certain alien priories. A supplementary charter was granted 1441, in which year also the college buildings were commenced. Some of the buildings were finished 1443, and were transferred by the royal commissioners to the provost, clerk, and scholars. Political troubles of various kinds retarded the completion of the buildings till 1523. Bishop Waynfleete was the first head-master, and afterward a munificent supporter of the college.

The chief buildings of the college consist of the chapel, the hall, the library, the schools, the provost's and master's apartments, and the lodgings of the fellows, surrounding two quadrangles; together with the boys' library and sleeping apartments, in a cluster called the new buildings. ETONIAN, n. *ē-tōn'ĭ-an*, a boy educated at Eton.

ETRURIA, n. *ĕ-trō'rĭ-ă*, anciently called also TYRRHENIA, or TUSCIA: ancient kingdom of Italy, comprehending nearly all Tuscany, Lucca, and part of the former Roman States. ETRUSCAN, a. *ĕ-trŭs'kăn*, pertaining to Etruria. —*Etruria*, at a period anterior to the foundation of Rome, designates nearly the whole of Italy, together with some of its most important western islands. Its n. part, from the Alps to the Apennines, was known under the name of Etruria Circumpadana; its s. from the Tiber down to the Gulf of Pæstum, or, according to some, to the Sicilian Sea, under the name of Etruria Campaniana; while the central portion, bounded n. by the Apennines and the river Macra, s. and e. by the Tiber, and w. by the Tyrrhenian Sea, was called Etruria Propria. The first two, however, did not long remain Etruscan territory, but were either reconquered by the surrounding tribes to whom they had originally belonged, or fell into the hands of new immigrants. No historical records of that brief period of any moment having yet come to light, they do not claim our attention; while Etruria Proper, scanty as is our information about it, attracts a high degree of interest. For its physical features, see TUSCANY: LUCCA: also the Transtiberine portions of the Papal Dominions. It is to be remarked here, however, that vast expanses of that country, now either covered with deep forest, or shunned on account of malaria, were in those times fruitful, densely peopled regions. For political, or rather administrative purposes, Etruria Proper was divided into 12 sovereign cities, or rather cantons, among which the most important were Tarquinii (Corneto), the cradle of the royal family of the Tarquins, who at one time wielded the sceptre of Rome; Cære (Argylla Cervetri), which, during the war of Rome with the Gauls, offered a refuge to the Roman Flamen Quirinalis and Vestal Virgins; Veii, the greatest and most powerful city of Etruria, with 100,000 inhabitants, which carried on seven wars with Rome; Clusium (Kamars, Chiusi), the chief of which, Porsena, as principal commander of the Etruscan troops, dictated a humiliating peace to Rome after she had expelled the Tarquins; Perusia (Perugia), destroyed in the Perusian civil war (40); Arretium (Arezzo), birthplace of Mæcenas. Of other not sovereign places may be mentioned Luca (Lucca), Pisæ (Pisa), on the Arnus, with the Portus Pisanus, now Leghorn, and Florentia (Firenze, Florence), on the Arnus.

To what nation the inhabitants—called Etruscans (= Exteri, strangers) or Tuscans in the Roman, Tyrrheni or Tyrseni (*Turrēnoi, Tursēnoi*) in the Greek, and Rasena (Tesne Rasne) in their own language—originally belonged, and what country they came from, was debated many hundred years before Christ, and is not settled yet. All the most ancient writers, save one of the most trustworthy, Dionysius of Halicarnassus, implicitly follow Herodotus, who—confounding the Etruscans, perhaps, as is his wont, with the Lydian *Turrēnoi*, or inhabitants of the city of Tyrrha—pronounces them Lydians, though there is not the slightest similarity between these two nations, and

though Xanthus, the Lydian historian, knows nothing whatever about a fabled famine of 18 years' duration in Lydia, followed by an emigration to Italy under a Prince Tyrrhenus. Dionysius himself offers no opinion; he calls them an indigenous race—which gives no real information; and it is surprising that some modern investigators, despairing of a rational solution of the old riddle, should have fallen back upon this evasive theory of 'autochthons.' Thucydides, in first confusing the Torrhebian pirates with the Pelasgian filibusters, gave rise to hopeless confusion about their very name. As to the innumerable theories and hypotheses since his day: Ciampi and Collar deem these people of Slavonic origin; Fréret calls them Celts; Micali, Albanese; Lami, Pfitzmaier, and Stickel, Semitics; and others variously make them Goths, Scandinavians, Basques, Assyrians, Phœnicians, Egyptians, and Armenians. The most rational and generally accepted opinion is that of Niebuhr—modified more or less by Ottfried Müller, Lanzi, Lepsius, Steub—of their being, when they first appear in history, a mixture of an eastern tribe, which had settled for a while in the Rhætian Alps (the Tyrol of to-day), and Pelasgians, whom they had found in their new Italian seats; these latter having, in their turn, since their immigration, mixed with the Umbrians, the oldest historical inhabitants of those parts. But, this is only the most rational opinion that emerges from a mist of wild speculation: authentic proofs of it have not yet been found; the question stands to-day precisely where it stood when Dionysius wrote: 'The Etruscans do not resemble any people in language and manners.'

Immense as was their influence on Roman, and, in fact, on European civilization, very little is known of their political history. Chiefly cultivating the arts of peace, they nevertheless seem, long after their heroic period, to have been powerful enough to scare away any invader, and this probably is the reason why historians have so little to record of them; but their decline may be said to stand in an inverted ratio to the rise of Rome. The 7th and earlier half of the 6th c. B.C. had been the most powerful and flourishing epoch of the Etruscan state in its widest sense—which then probably had been in existence four or five hundred years. Whether they had put their Tarquinii as governors over conquered Rome, or whether, on the contrary, the reign of this Etruscan family would denote the subjugation of southern Etruria by Rome, is not clear; but the expulsion of the last Roman king, Tarquinius (Tarchon), called Superbus, was followed, about B.C. 507, by a war between the Etruscans, under Porsena of Clusium, and the Romans, which, though ending in a most ignominious peace, dictated within the walls of Rome, did not bring about the restoration of the Tarquinian dynasty. From the wars between Veii and Rome, which began B.C. 486, and ended—interrupted only by an occasional armistice—395, with the destruction of Veii, dates the gradual but sure extinction of Etruria as an independent state. The Gauls advancing from the N., the Etruscans were forced to

conclude a 40 years' truce with their adversaaies at any price; but these over, and the Romans being engaged with the Samnites, the Etruscans recommenced the hostilities more fiercely than ever. In this last war, the Romans succeeded, B.C. 309, under Q. Fabius Maximus, in twice defeating them, and Fabius crossed the Ciminian forest—the frontier sacred from time immemorial; and when, B.C. 283, P. Cornelius Dolabella had beaten both them and their Gallic auxiliaries in a decisive and sanguinary battle at the Vadimonian Lake, Etruria became a Roman province; and about 200 years later, the Lex Julia conferred upon her inhabitants, as a reward for their fidelity, the right of citizenship. Till that time, they had succeeded in keeping up their own singularly distinct creed, customs, traditions, language—their nationality, in fact; when Sulla, B.C. 82, infuriated by the part that they had taken against him, liberally bestowed great portions of their land upon his veterans; and abt. 50 years later, Octavianus planted his military colonies there. This wrought and completed the transformation of that mysterious conglomeration of heterogeneous races and tribes, hitherto called Etrurians, into Romans. Once more, well nigh 2,000 years after its extinction, the kingdom of Etruria (Hetruria) rose before the eyes of the world. The peace of Luneville re-created it, and conferred it on the hereditary prince, Louis of Parma; after whose death, his widow, the Infanta Louisa of Spain, administered the government for their son, Charles Louis, till 1807, when it became a French province. From 1809, it again bore the name of the Grand Duchy of Tuscany. For its modern history, see TUSCANY: ITALY.

Twelve cities are spoken of above as forming the confederacy of Etruria Proper. Similar confederacies of 12 cities were established, independently of each other, in the two other Etrurias. The cities themselves, however, cannot be definitely named now in all cases. From the fact of more than 12 autonomous ones being recorded in Etruria Proper, it would appear that some among these 12 confederates, or *populi*, possessed more than one capital city, each populus, however, being limited to one representative vote in the general council. The members of the confederacy were bound to appear regularly at an annual religious assembly near the temple of Voltumna, whose locality is not known. Here great fairs were held for the people; common operations of war being discussed by the *principes*, and a gen.-in-chief for the ensuiug year elected from their number. Each city or canton, in the earlier times at least, had a king (Lucumo, Lauchme = Inspired), chosen for life, who at the same time acted as high-priest; and a hereditary nobility, which alone was eligible to the higher offices of state. Next to them, in the political and social scale, came the people properly so called—free, not subject personally to the nobility; lowest stood a great number of clients or bondmen, probably descendants of subjected original inhabitants. On the whole, the federal interdependence between the cities was far from close. Single cities carried on wars in which the others took no part; and when the

confederacy resolved on general action, there were always some members which, for one reason or other, stood aloof. It appears from this that the Etruscan constitution was analogous to the Greek and Roman in their earliest stages: the community develops itself into a *polis* or city, chooses a head, or rather high-priest, and enters into a more or less intimate alliance with its neighboring cities; but, besides that king of its own, recognizes a common chief only in time of war.

The Etruscans were, as a people, less warlike than any of their neighbors, especially the Romans, and conspicuous is their want of anything like cavalry. Theirs was also the un-Italic custom of hiring soldiers, and their energies seem to have been directed principally to the more profitable occupations of trade and agriculture. One of the chief articles of their commerce was amber, which Germans brought from the Baltic to Etruria Circumpadana, whence it was conveyed to Greece by sea. In the w. parts of the Mediterranean, they were formidable as pirates; while they were welcomed by the Carthaginians and the Greeks of Magna Græcia, as importers of indigenous products of nature and art, which they exchanged for the wealth of the East and South. That their commerce within Italy must have been very extensive, appears from the fact that all the states of Central Italy adopted their system of coinage, based, like their tables of weights and measures, and many of their political institutions, on the duodecimal system.

The striking contrast between the Etruscans and their Italic and Greek neighbors, which appears in the short thickest frames, the large heads and bulky extremities of the former, and the slender limbs and graceful harmony in the whole structure of the latter, and which runs with equal distinctness through the intellectual lives of the three nations, manifests itself nowhere with greater power than in their religions. Equally distant from the abstract, clear rationalism of the Latins, and the plastic joyfulness of Hellenic image-worship, the Etruscans were, as far as their dumb fragments show—for what we find on tthem of human words we do not understand—chained in a dark and dotard mysticism, such as might be produced from a blending of a half-forgotten Eastern symbol-service with barbarous religious practices of northern savages, grafted upon archaic Greek notions. In their Pantheon, the predominance belongs to the evil, mischievous gods; their prisoners are welcome sacrifices to the heavenly powers; they have no silent depths where the 'good spirits' of their departed dwell, but a hell of the most hideous description, and a heaven where permanent intoxication is the bliss that awaits the virtuous. They divided their gods into two classes, and they place them in the most northern, therefore most immovable point of the world, whence they can best overlook it. The upper section is formed by shrouded, hidden gods (Involuti), of uncertain number, who act awfully and mysteriously, and 12 lower gods of both sexes, called Consentes, Complices. Tinia (Zeus, Jupiter) is the

chief of these latter, and stands between the two divisions of the gods, receiving orders for destruction from the upper ones, while the lower ones form his ordinary council, and obey his behests. Nine of these (Novensiles) hurl lightnings at various times and with peculiar effects. The three of these deities which seem to have been the principal objects of worship were Tinia himself, armed with three different kinds of lightning, Cupra (Hera or Juno), and Menrfa (Minerva, Pallas Athene). Gods most peculiarly Etruscan are Vejovis, an evil Jupiter, whose thunderbolts have the power to deafen, and Nortia, the goddess of Fate, called also Lasa Mean. Besides these, they put a host of demons over the different portions of the creation: the heavens, the earth, and the lower regions (Penates, Lares, and Manes). Their deities generally have wings; and before the Assyrian bulls had come to light, some antiquaries established from this a connection with the Hebrew winged cherubim. Characteristic in the highest degree is their 'disciplina' or art of 'divination.' This had been revealed by Tages, grandson of Jupiter, who, according to the myth, was dug out near Tarquinii, in the shape of a childlike dwarf with gray hair—a most striking caricature of these both childish and senile practices—and who died immediately after having communicated these mysteries. They were at first the property of the noble families; but in the course of time, as others were initiated, and schools for priests were founded, these mystical and awe-striking teachings came to be written down. It is saddening to observe here again in what monstrous insanities the spirit of man occasionally revels, and that, too, in the province of what is noblest and highest—religion. The 'disciplina' was developed into an exact science, fully as minutely and casuistically sharpening its points and splitting its hairs as Hindu or Mohammedan theology would. It taught what gods hurled the different kinds of lightning; how, by the color and the peculiar quarter of the sky, the author of the bolt might be recognized; whether the evil denoted was a lasting or a passing one; whether the decree was irrevocable or could be postponed; how the lightning was to be coaxed down, and how it was to be buried. This was the speciality of the Fulgurales. The Haruspices had as their share the explanation of portents, prodigies, monsters, the flight and cries of birds, the entrails of sacrificial animals; while others ministered in the holy rites at the foundation of cities, the building of gates, houses, etc. Their ceremonies (a word derived from their town Cære) were endless and silly, but the show and pomp with which their priests knew how to surround these juggleries, and from which the Romans largely borrowed, made them acceptable in the eyes of the herd; and though Rome herself, with all her augurs, called Etruria 'the mother of superstition,' there was a certain odor of tithes and fees about these rites which made many anxious to 'preserve religion in its primeval purity.'

In the entire absence of anything like a genuine Etruscan account, even the outlines of the relation between their

religion and that of the Greeks on the one hand, and the Romans on the other, are exceedingly difficult to trace; so much, however, is certain, that they adopted and assimilated many points of archaic Greek theology, and clothed them in a garb of their own, and that this process was repeated still more completely by the Romans in their turn, with respect to the religious notions of the Etruscans. See GREEK RELIGION: ROMAN RELIGION, ANCIENT.

The high civilization which the Etruscans possessed long before Rome was heard of, is testified by innumerable works of masonry and art. The Etruscans were of an eminently practical turn of mind, and domestic, like the northern nations. Trusting to their priests for reconciliation with the gods, who seemed always irate, but whose angry decrees could easily be foreseen and averted, they set to work in developing the inner resources of the country, and in making the best use of their intercourse with foreign countries. They thus became eminent in agriculture, navigation, military tactics, medicine, astronomy, and the like; and in all these, as well as in some of the minutiæ of their dress and furniture, the Romans became their ready disciples and imitators. The division of the year into 12 months, of the months into kalends and nones and ides, the designation of the numerals, were Etruscan; from the same source were derived the *toga prætexta* as well as the pomp of triumphs, the *lictors* and *apparitors*, down to the ivory curule chairs. The towns of the Etruscans were clean and healthful, owing to their perfect system of drainage and sewerage; they tunneled and excavated, they embanked and irrigated, they turned swamps into cities, changed the course of streams, and excelled in various kinds of useful public and private works. Their ideal was not the beautiful or the spiritual, but a comfortable, and, if possible, luxurious existence. As a special proof of their love for their own hearth, a quality imported probably from the north, we might adduce their invention of the atrium, the common sitting-room of the family, where the master of the house sat surrounded by his penates and the figures of his ancestors, while the wife and her handmaidens plied the labors of the loom or the distaff. As in the Germanic nations, woman stood in high estimation. She was the companion, not the slave, of the husband, and thus had certainly not a little share in the softening of their primitive wildness, and in counteracting the sombreness of their creed. The fact that even in their tomb-paintings they are seen engaged in convivial carousings, dancing, races, athletic games, and that they liked that their very worship should be accompanied by the sound of flutes, horns, and trumpets, only shows that that glorious sky of theirs, their intercourse with the nations, their wealth and culture, had gradually caused their antique and gloomy austerity to wear off, even as it wore off with the Romans and other peoples; for to assume with some that the boisterous scenes referred to were caused more or less by the despair arising from the loss of their independence, would be going too far. Licentiousness is the sure forerunner of the fall of a nation, but a

whole people does not take refuge in enjoyment when their all is lost. We know little of Etruscan literature; it seems to have consisted mostly of rituals, religious hymns, and some historical works. Whether the Fescennines, certain mocking-songs, sung in alternate verses, with musical accompaniment, at nuptials, originated with them or not, is not decided.

We have alluded to the high proficiency of this people in architecture; they were, in fact, so renowned in this craft throughout the antique world, that, as Solomon called Phœnicians to Jerusalem to build his temple, so the Romans sought in Etruria the framers of their grandest masonic structures, such as the Cloaca Maxima, the Temple of Jupiter on the Capitol, etc. The peculiarly fantastic and, withal, powerful mind which speaks in all their institutions equally pervades their architectural productions; but, at the same time, everything that they built, they built either for practical or pious purposes. Their manner, differing in various epochs, never reached anything like a distinct national completeness, their eagerness to profit by foreign examples not allowing them to develop it to the full unalloyed. Of their walls and gates, temples and porticoes, theatres and amphitheatres, bridges and sewers, gigantic, and, in the earliest times, cyclopean—erected, in Eastern fashion, evidently by hosts of slaves—very little is extant in so complete a form as to afford exact insight into their mode of construction; and were it not for their tombs, our knowledge would be exceedingly limited. These form one of the most peculiar features in Etruscan antiquities. Hewn in rocks, either below the ground or in the face of a cliff, they were adorned outside with a somewhat Egyptian façade of a temple or a house, which semblance of a house the insides most exactly reproduce, with all their internal decorations, furniture, and utensils. Of the paintings around the walls, which are our safest and most complete guides to the inner life of this nation, more is said below. Their temples bore in primitive times, and always retained in some measure, so far as we can judge, the unfinished character of the wood-buildings of the northern mountain tribes—a square, half-house, half-fortification, overloaded with quaint ornamentation.

In their plastic and pictorial arts, Winckelmann has established three distinct styles—to which Dennis has added a fourth—viz, the Egyptian, with Babylonian analogies, the Etruscan or Tyrrhene proper, the Hellenic, and that of the *decadence*. Characteristic of the first style are the prevalence of straight lines, right angles, faces of an oblong, contracted oval, with a pointed chin, eyes mostly drawn upward, arms hanging close to the side, legs close together, drapery long in straight parallel lines, hair disposed in tiers of curls. In this style, the attitude is constrained, the action stiff and cramped. The progress shown by the second style is the greater attention bestowed on the delineation of the muscles, which swell out in disproportionate prominences on the now almost entirely nude body. The two remaining styles explain themselves. Their statuary, as it

appears chiefly on sarcophagi and cinerary urns, likewise suggests an Egyptian origin. The figures are those of their own mystical and awful Hades, instead of the Bacchic processions of Greece and Rome. The grouping follows rather a pictorial than a plastic principle; the motion is hasty and forced; but the features of the deceased, hewn on the lid, have all the rude accuracy of a spiritless portrait. Statues of deities in wood and stone have been found, but very rarely. Of nigh renown were their ornaments and utensils in baked clay (terra cotta), in the manufacture of which objects the Veientes were especially famous. Rome at a very early period possessed of this material a quadriga and the statue of Summanus, made by Etruscans. Of the art of working in bronze, the Etruscans were supposed to be inventors; that they brought it to a very high degree of perfection is evident from the examples which remain Statues and utensils were manufactured and exported in immense quantities, not only to Rome, but to every part of the known world. Of figures on a large scale still extant are the renowned She-wolf of the Capitol, the Chimæra in the Museum of Florence, the Warrior of Todi in the Etruscan Museum of the Vatican; a portrait-statue of an Orator, with the inscription Aule Meteli, in Florence; and the Boy with the Goose at Leyden. The various objects of ornament and use, found in great numbers in tombs, such as candelabra, cups, tripods, caldrons, couches, disks; articles of armor, as helmets, cuirasses, etc.; musical instruments, fans, cists or caskets, are most of them models of exquisite finish and artistic skill. Their gems are as numerous as those of Egypt, and, like them, cut into the form of the *scarabæus* or beetle. They were exclusively intaglios, of carnelian, sardonyx, and agate. On these the Etruscan artists represent groups from the Greek mythology, or the heroic cycle, lacking, as they seem to have been, in heroic legends of their own. They are found most frequently at Chiusi and Vulci, and were worn as charms and amulets. Special mention should be made of the metal *specula*, or mirrors, with figures scratched upon the concave side, the front or convex side being highly polished. These ranged over all the phases of Etruscan art, and are especially and peculiarly Etruscan. None but Etruscan inscriptions have ever been found on them. They will, no doubt, prove eventually of the highest importance, not only by enabling us to follow the gradations of artistic development step by step, but by furnishing us with lists of names of gods and persons, and, it may be, of objects.

The vases and urns found in innumerable quantities in Etruscan tombs, are admitted on all hands to be, with very few exceptions, Greek, both in design and workmanship (see VASES). The tomb-paintings are found chiefly in the cemeteries of Tarquinii and Clusium; and they are all the more important, as they lead us with minute accuracy from the very cradle of the individual, through the various scenes of his entire life, to its close; and this throughout the existence of the nation itself, beginning before the

foundation of Rome, and ending in the Empire; while we follow the style in its gradual development from the Egyptian to Græco-Roman perfection. One of the annexed specimens, taken from a tomb at Corneto, represents a death-bed scene; but most of the other paintings, especially at Tarquinii, are of a very different description, as the other specimens show. Life in its merriest aspects gleams in the most vivid of colors all round—dancing, feasting, loving

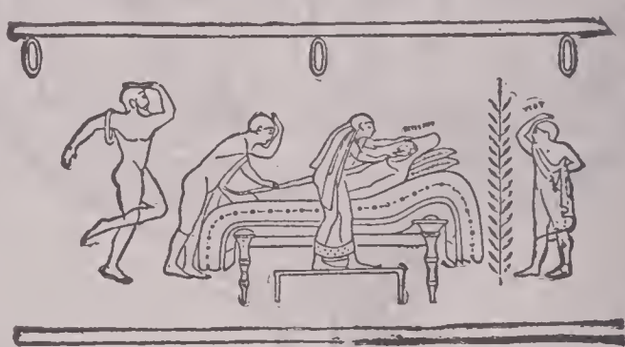
Etruscan Mirror from Vulci, with Phuphluns (Bacchus), Semla (Semele), and Apulu (Apollo).
After a drawing by Mr. George Scharf.

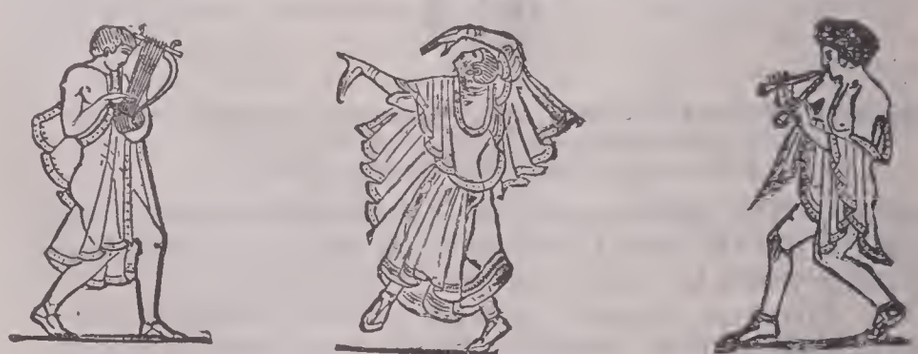
hunting. The Etruscans of later times had learned in the school of the Hellenes to dread death less, and to think of the other world as one of continued joyfulness.

The Etruscan language is preserved in more than 3,000 inscriptions, and this number will no doubt be doubled by the opening of new sepulchral chambers, with which the soil of ancient Etruria is teeming. These inscriptions are found on sarcophagi, urns, vases, columns, statues, and mirrors in bronze. The latter article was a favorite object for the representation of scenes from Greek mythology, and from this source we learn the names of the principal native deities. *Tinia* was Jupiter; *Usil*, the sun; *Fufluns*, Bacchus.

Sethlans, Vulcanus; *Thurms*, Mercurius; *Turan*, Venus; *Thalna*, Juno; *Thesan*, Aurora. Some of the minor female deities are called *Lasa*, *Maris*, *Mean*, *Vanth*. The inscriptions are of two kinds—the archaic and the more recent. The former, generally beginning with the syllable MI, are distinguished not merely by a more ancient form of the alphabet, but also by a more refined condition of the language. In the older inscriptions consonants and vowels are evenly balanced. But in the documents of later date, short vowels are generally omitted, and, in consequence, combinations of conso-

Crater. Amphora Cylix.





nants appear which remind us strongly of the cacophonous forms of some of the Slavonic languages. Compare the following specimens: 1. *Mi Tesantaia Tarhumenaia.* 2. *Laris Sesctna Lumscial.*

With regard to the grammar, the following points may be considered as established. In the singular of nouns, the nominative ends in *s;* the genitive, according to the class of declensions, in *a-s*, *e-s*, *i-s*, *u-s;* the dative in *si* or *s*. But these terminations are very often dropped, as in early

Latin. In the Cippus Perusinus, both the largest and best preserved inscription of all now in existence, we find of the proper names Velthina and Afuna the cases: *Velthina, Velthinam, Velthinas; Afuna, Afunam, Afunas.* The suffix *al* serves mostly, but not exclusively, for the expression of a metronymic: *Thana Seianti Latinial,* for example, is Thana Seiantia, *daughter* of Latinia. Another very common suffix—*asa, esa, isa, usa*—designates the matrimonial relation of women: *Thana Aulnei Canznasa* is Thana Aulneia, *wife* of Canzna; *Tha Setumnei Pumpunisa* is Thana Setumneia, *wife* of Pomponius. It is clear that this suffix consists of the genitives in *as, es, is, us,* with the addition of an *a,* so that grammatically and logically the wife is defined as part and parcel of her husband. Verbal forms do not occur often, but it is certain that the preterite is formed from the root by the addition of the syllable *ce,* like *tur-ce, the-ce, lupu-ce, sval-ce.* The numerals sound rather strange. *Mach, thu, zal, huth, ki, sa,* are 1–6; but as yet the individual meaning of each of these is unknown. The same must be said of *sesphs, esal, mu* or *muv,* the numerals for 7–9. Decades are expressed by *alch(a)l,* e.g., *sespalchal, muvalchl, cealchl.* 90 was probably *zathrums.* The meaning of about 10 or 12 words, such as *clan,* son; *sech,* wife; *avil,* age; *vril,* year; *hinthial,* spirit; *fleres,* statue, can be clearly established; but as yet no affinity has been discovered between these and the corresponding expressions in Aryan or other languages. The following two inscriptions are given with a translation which in one or two points is conjectural:

Vipia Alsinai turce Versenas Caiia.
Vibia Alsinæa dedit Versenæ, Caiæ filiæ.

The second is found on the celebrated bronze statue of the orator, now in the museum of Florence;

Aulesi Metelis Ve Vesial clensi cen fleres tece
Aulo Metello Veliæ Vesiæ filio hoc signum posuit
sansl tenine tuthines chisulics.
jussu concilii publici magistratus (?).

The few bilingual inscriptions (altogether 15) throw no light on the language, as they contain only proper names. The so-called Tyrrhenian glosses, preserved in the lexicon of Hesychius, are worse than useless for critical purposes.

ETRUSCAN LANGUAGE: see ETRURIA.

ETSCH: see ADIGÉ.

ETTER-PIKE, n. *ĕt'ĕr-pīk* [AS. poison]: the lesser weaver or sting-fish, *Trachinus vipera.* ETTER-CAP, n. *-kăp,* a spider; hence figuratively, a virulent, atrabilious person.

ETTLE, v. *ĕt'l* [Icel. *atla,* or *ætla,* to purpose]: in *Scot.* and *prov. Eng.,* to purpose; to design; to aspire; to expect; to attempt. ETTLING, imp. *ĕt'lĭng.* ETTLED, pp. *ĕt'ld.*

ETTMÜLLER, *ĕt'mül-ĕr,* ERNST MORITZ LUDWIG: 1802, Oct, 5—1877, Apr.; b. Gersdorf, in Upper Lusatia: writer on German antiquities. He studied medicine at Leipsic 1823–26,

but subsequently the language and history of his native country. In 1830, having taken his degree PH.D. at Jena, he began to deliver lectures there on the German poets of the middle ages; in 1833 he was called to the Zürich Acad. and in 1863 to the univ. there, as prof. of German literature. E.'s literary activity has been chiefly in the editing of the literary remains of the Middle High-German and older Low-German dialects. To the former belong his *Sant Oswaldes Leben* (Zürich 1835); *Hadeloubes Lieder und Sprüche* (Zürich 1840); *Heinrich's Von Meissen des Frouwenlobes Lieder, Leiche, und Sprüche* (Quedlinb. 1834); *Frowen Helchen Süne* (Zürich 1846); *Heinrich's Von Veldecke Eneide* (Zürich 1852). Of poems in Low German he published, among others, *Theophilus* (Quedlinb. 1849); and *Wizlâwes IV., des Fürsten Von Rügen, Lieder und Sprüche* (Quedlinb. 1852). In 1850 appeared, under his editorship, an Anglo-Saxon chrestomathy; in the following year his much-valued *Lexicon Anglo-Saxonicum*. E. studied also old Norse literature, as is shown by an edition of the *Völuspâ*, translations, and a Norse reading-book. He wrote several original poems: his *Deutsche Stammkönige* appeared at Zürich 1844; his *Kaiser Karl d. Gr. und das Fränkische Jungfrauenheer*, 1487; and his *Karl d. Gr. und der Heilige Goar*, 1852; *Herbstabende und Sommernächte* are essays on his favorite subjects (3 vols. 1865–67).

ETTRICK, *ĕt'rĭk:* pastoral vale in the s. of Selkirkshire, Scotland, watered by the Ettrick river, which rises amid bleak hills in the s.w. corner of the county near Ettrick Pen, 2,258 ft. high, flows 28 m. n.e. and falls into the Tweed. Its chief affluent is the Yarrow, which runs 25 m. from the w., through one of the loveliest of Scotch vales, and the scene of many a plaintive song. Ettrick Forest, a royal hunting tract, swarming with deer till the time of James V., included Selkirkshire and some tracts to the north. In Ettrick Vale, at Tushielaw, dwelt the celebrated freebooter or king of the Border, Adam Scot, who was summarily put to death by James V. The district derives some note from two persons in modern times—Thomas Boston (q.v.), minister of the parish of Ettrick; and James Hogg, poet, who, having been originally a shepherd in this part of the country, became known as 'the Ettrick Shepherd.'

ETTRINGITE, n. *ĕt'trĭng-īt* [named from *Ettringen*, on the Rhine, where it occurs]: in *mineral.*, name given by Lehmann to a hydrated sulphate of lime and alumina. Crystallization hexagonal. In minute needles in limestone inclosures of a lava.

ETTY, *ĕt'ĭ*, WILLIAM, R.A.: 1787, Mar. 10—1849, Nov. 30; b. York, England: artist. His father was a miller and spice-maker. Before he was 12 years of age, he was apprenticed to a printer, and served out his term of seven years of drudgery. Freed at last, and assisted by some relatives, in 1805, at the age of 18, he entered on the study of art, and, after a year's probation, was admitted a Royal Acad. student. For a series of years he was

invariably surpassed by many fellow-students. After six years of study he obtained a place for a picture in the Exhibition of the Royal Acad. On his return from Italy, 1822, he was elected an Assoc. of the Academy. In 1824, his *chef-d'œuvre, The Combat—Woman pleading for the Vanquished,* was purchased by an artist, John Martin. In 1828, he was elected Academician by the Royal Acad. He executed nine pictures on a very large scale, viz.: *The Combat;* series of three pictures illustrating the delivery of Bethulia by Judith; *Benaiah slaying two Lion-like Men of Moab* (these five, the best of his large works, were purchased by the Royal Scottish Acad.); *The Syrens,* now in the Manchester Institution; and three pictures, illustrating the history of Joan of Arc. His smaller works are numerous. Besides his large works he sent for exhibition to the Royal Acad. and British Institution, 1811–49 no less than 230 pictures. The following may be particularly noted: *The Coral-finders; Venus and her youthful Satellites arriving at the Isle of Paphos; Cleopatra's Arrival in Cilicia;* a composition from the 11th book of *Paradise Lost* (*Bevy of Fair Women*); *the Storm; Sabrina; The Warrior Arming; Youth at the Prow, and Pleasure at the Helm; The Danee,* from Homer's description of Achilles's Shield; *Britomart redeems Fair Amoret, Dance on the Sands, and yet no Footing seen; Amoret Chained.*—See E.'s Life by Gilchrist (London 1855).

ETYMOLOGY, n. *ĕt'ĭ-mŏl'ŏ-jĭ* [L. *ĕtymŏlŏgĭă*—from Gr. *etŭmŏs,* true; *logos,* a word; L. *etymon;* Gr. *etumon,* the true source of a word: F. *étumologie*]: department of the study of language which traces words to their elements, their original forms, and primary significations. ET'YMOL'OGIST, n. one who. ET'YMOLOG'ICAL, a. *-mŏ-lŏj'ĭkăl,* pertaining to etymology. ET'YMOLOG'ICALLY, ad. *lī.* ET'YMOL'OGIZE, v. *-mŏl'ŏ-jīz,* to search into the origin and primary meaning of words. ET'YMOL'OGIZING, imp. ET'YMOL'OGIZED, pp. *-jīzd.* ETYMON, n. *ĕt'ĭ-mŏn,* an original or primitive word; a root.—*Etymology* is that part of grammar that treats of the derivation of words. It embraces the consideration of the elements of words, or letters and syllables, the different kinds of words, their forms, and the notions that they convey; and lastly, the modes of their formation by derivation and composition. Etymological inquiries have been a favorite pursuit from the earliest times. In the book of Genesis, numerous indications are given of the derivation of proper names. Homer also attempts etymologies of the names of gods and men, which, however, are only more or less ingenious fancies. The grammarians of Alexandria and Varro among the Romans tried to base their etymologies on something like principle; but the wildest conjectures continued to be indulged in, and the results were little better than guess-work, till a very recent period. As philology extended its sphere, and became acquainted with the languages of the East,—especially the Sanscrit, etymology took on a new form.

It no longer sought the relations of the words of a single language exclusively within itself, but extended its view to a whole group, e.g., the Teutonic, or wider still, to a whole family, as the Indo-European, or Aryan (q.v.), and became a new science. See PHILOLOGY.

Etymology forms a subsidiary part of the science of comparative philology, and while it has challenged the attention of the learned and the curious in almost every age, it was not until after the beginning of the 19th century that its study was pursued with anything like scientific method. Since that time great advances have been made, especially by German philologists, and etymology no longer teaches merely that one word is derived from another; in addition it endeavors to show how a particular word has been regularly and naturally changed into another, testing its conclusions by the laws of phonetics.

We take a word and follow it with all its changes of form, both in a given language and in other languages having kindred relations with it, until we discover its original meaning. The object of the etymologist, however, is not to seek the true meaning of a word, but rather the history of the meaning as well as the form. Folk-etymology has played an important part in the development of languages. Words that the people have known from infancy have for them certain and definite meanings; but it is different with the new terms which they encounter in their daily experiences. These excite their curiosity, and they seek the signification in the resemblance of sound to words already known, and while advancing steadily toward the truth they sometimes reach erroneous conclusions. These folk-etymologies sometimes effect the form of the word. 'Before attempting an etymology,' wrote Prof. Skeat, 'ascertain the earliest form and use of the word, and observe chronology. If the word be of native origin, we should next trace its history in cognate languages. If the word be borrowed, we must observe geography and the history of events, remembering that borrowings are due to actual contact.' *Etymologicum Magnum* is the name of a Greek lexicon, the oldest of the kind, professing to give the roots of the words. It appears to belong to the 10th c.; the author is unknown. The etymologies are mere guesses, sometimes right, often wildly absurd; but the book is valuable, as containing many traditions and notices of the meanings of old and unusual words. There is an edition by Schäfer (Leip. 1816); one by Sturz, *Etymologicum Gudianum* (Leip. 1818); another by Gaisford (Oxf. 1849).

EU, *ŭh:* moderately well-built town of France, dept. of the lower Seine, Normandy, near the mouth of the Bresle, 93 m. n.n.w. of Paris. It is remarkable for its fine Gothic church, and for the Château d'Eu. E manufactures sail-cloth, ropes, soap, lace, and silk. The château was purchased by Mademoiselle de Montpensier 1675, and later came into the possession of the Duke of Maine.

from whom it passed to the Duke of Penthièvre, maternal grandfather of Louis Philippe, who succeeded to it 1821. Louis Philippe expended large sums on the embellishment of the château, especially on its magnificent park and the unique portrait-gallery. The eldest son of the Duke of Nemours (b. 1842, Apr. 29) received from his royal grandfather the title of Count d'Eu. He married (1864) Isabel, heiress-apparent of the throne of Brazil; and was commander-in-chief of the Brazilian army in the war with Paraguay, 1869. Compare Vatout, *Le Château d'Eu, Notices Historiques* (5 vols. Paris 1836); his *Résidences Royales* (Paris 1839). Pop. 5,000.

EUASTRUM, n. *ū-ăs'trŭm* [Gr. *euasteros*, rich in stars; *eu*, rich or abundant in; *asteros*, a star]: in *bot.*, genus of algals, sub-order *Desmidieæ.*

EUBŒA, *ū-bē'a* (ancient, *Euboia;* Turkish, *Egripo;* Ital. *Negroponte*): largest island in the Ægean Sea; a portion of the present kingdom of Greece. Until recently, it was called Negropont. It is bounded n. by the Trikeri Channel, and w. by the channels of Talanta and Egripo. It extends in a direction parallel to the mainland; is 105 English statute m. long, and 30 m. in extreme breadth, though in one part its breadth is scarcely four miles. At the narrowest part, it is connected with the mainland by a bridge. The island is intersected by a chain of mountains, running n.w. and s.e., and attaining in the centre, in the range of Mount Delphi, an elevation of about 4,500 ft. Copper and other metals are obtained in the island, which contains also numerous hot springs. The pastures are excellent, and the declivities of the mountains covered with forests of fir-trees. The climate is salubrious, the valleys well watered and very fertile, but little cultivated. The chief products are cotton, oil, wine, wheat, fruit, and honey. The inhabitants are engaged chiefly in the breeding of cattle; they export wool, hides, and cheese, as well as oil and grain. The chief towns are Chalcis (q.v.) on the n., and Carystos on the s. coast, the latter having a pop. of 3,000. Eubœa was peopled in early historic times chiefly by Ionic Greeks, afterward by colonists from Athens, who formed a number of independent cities or states. These were at first monarchical in their constitution, but at a later period democratic. They soon rose to power and prosperity. After the Persian wars, however, Eubœa was subjugated by the Athenians, under whose rule it continued till they were subdued by Philip of Macedon. By the Romans, it was finally united with the province of Achaia under Vespasian. In 1204, it came into the possession of the Venetians, and received the name of Negroponte. In 1470, the island was taken by the Turks, in whose hands it remained till 1821, when the inhabitants rose to vindicate their independence at the call of the beautiful Modena Maurogenia. It now forms a portion of the modern kingdom of Greece. Pop. 115,515.

EUBOTRYS, n. *ū-bŏt'rĭs* [Gr. *eubotrus*, rich in grapes; *eu*, rich or abounding; *botrus*, cluster or bunch of grapes]:

in *bot.*, genus of *Ericaceæ*. *E. arborea* (formerly *Lyonia arborea*) is the sorrel-tree of America, the acid leaves of which are chewed by hunters to assuage their thirst.

EUCAIRITE, n. *ū-kār′īt* [Ger. *eukairit*—from Gr. *eukairos*, seasonable; *eu*, good; *kaı̇ros*, the right point of time · named because opportunely discovered]: a soft mineral easily cut by the knife; color between silver white and lead-gray, lustre metallic, structure massive and granular, or in black metallic films. Composition: selenium, 31.6; copper, 25.3; silver, 43.1 = 100. It is found in Sweden, Chili, etc.

EUCALYN, n. *ū′kăl-ĭn* [Eng. *eucalyptus*, suff. *-in*]: in *chem.*, unfermentable sugar, which separates in the fermentation of melitose (the sugar of Eucalyptus). It is a thick syrup, which polarizes to the right, and does not reduce copper solution.

EUCALYPTOCRINUS, n. *ū-kă-lĭp-tō-krī′nŭs* [Gr. *eu*, well; *kaluptos*, covered; *krinon*, a lily]: in *paleon.*, typical genus of the family *Eucalytocrinidæ*. The calyx is invected upon itself, whence the name of the genus. It ranges in time from the Silurian to the Devonian rocks.

EUCALYPTOL, n. *ū-kă-lĭp′tŏl* [Eng. *eucalyptus;* L. *oleum*, oil]: in *chem.*, volatile oil obtained from *Eucalyptus globulus*. It contains 70 per cent. of eucalyptene and 30 per cent. of cymene.

EUCALYPTUS, n. *ū′kă-lĭp′tŭs* [Gr. *eu*, well; *kaluptō*, I cover]: genus of trees of the nat. ord. *Myrtaceæ*, suborder *Leptospermeæ*, containing a large number of species, natives mostly of Australia, and which, with trees of nearly allied genera, form one of the most characteristic features of the vegetation of that part of the world. The genus occurs also, though much more sparingly, in the Malayan Archipelago. The trees of this genus have entire and leathery leaves, in which a notable quantity of a volatile aromatic oil is usually present. The leaves, instead of having one of their surfaces toward the sky, and the other toward the earth, are often placed with their edges in these directions, so that each side is equally exposed to the light. Many species abound in resinous secretions, and are therefore called Gum-trees in Australia. Some of the species are among the largest living species of the world. Specimens exceeding 450 ft. in height and with a girth of 50 ft. are occasionally reported, and trees of 400 ft. in height are often found. They are of very rapid growth; and their timber, when green, is soft, so that they are easily felled, split, or sown; but when dry, it becomes very hard. It is used for a great variety of purposes, among which is ship-building. The bark of many species abounds in tannin, and has become to some extent an article of commerce. Some kinds of it are said to be twice as rich in tannin as oak-bark. The bark of some is remarkable for hardness; while some throw off their outer bark in longitudinal strips or ribbons, which, hanging down from their stems and branches, have a very

singular appearance.—Among the resinous secretions of this genus is the substance called Botany Bay Kino, used in medicine as a substitute for kino (q.v.). It is the produce of *E. resinifera*, a species with ovato-lanceolate leaves, known in Australia as the Red Gum Tree and Iron Bark Tree, attaining a height of 150–200 ft. When the bark is wounded, a red juice flows very freely, and hardens in the air into masses of irregular form, inodorous, transparent, almost black when large, but of a beautiful ruby red in small and thin fragments. Botany Bay Kino is said to consist chiefly of a peculiar principle called *Eucalyptin*, analogous to tannin. *E. robusta*, Stringy Bark Tree, also lofty, yields a most beautiful red gum, which is found filling large cavities in its stem, between the concentric circles of wood.—*E. manifera* yields, from its leaves, an exudation resembling manna, less nauseous, and of similar medicinal properties. It contains a saccharine substance, different from *mannite*, from *glucose*, and from all previously known kinds of sugar. Another similar exudation, from the leaves of *E. dumosa*, is sometimes seen spread over large districts like snow, and used by the natives as food.—The Tasmanian Blue Gum Tree, one of the Eucalypti, which often exceeds 300 feet in height, has bluish or grayish smooth bark, except at the base. It is noted for its rapid growth, the unpleasantly flavored nectar of its blossoms, which are very attractive to bees, and its ability to withstand long periods of drought. It is the most frequently planted species in California, where it is also becoming naturalized by means of its seeds. It is also planted to some extent in Florida and other Gulf States, and is said to survive a temperature as low as 20° F. It is one of the most valuable of timber trees and is one of the chief scoures of oil of eucalyptus. Trees of eucalyptus have been planted, especially in low marshy places, with a belief in their beneficial effects against malaria. It is frequently asserted that they have a direct action on malaria. By the aid they furnish in converting marshes into dry land they also help to prevent the development of mosquitoes, some forms of which are known to be the chief agents in the spread of malarial disease. EUCALYPTUS GLOBULUS, *glŏb′ū-lŭs* [L. *glŏbus*, a ball, a sphere]: the blue gum-tree or fever gum-tree, furnishing an astringent bark and a fragrant oil.

EUCALYPTUS OIL: the greater portion of this oil is obtained from Australia, though some of it is prepared in Algiers and, at one time, a little was supplied from California. Practically all the various species of eucalyptus trees furnish oil, but only a few of them supply it on a commercial scale. It is generally prepared by treating the leaves with steam, in retorts; water and oil pass over, are condensed together and then separated the oil being sometimes partially freed from aldehyde, (q.v.). The composition of the oil differs somewhat according to the method of preparation and largely according to the species of eucalyptus from which it origi-

nates. In general, it consists chiefly of dextropinene (a terpene) together with smaller and variable quantities of cuminic aldehyde, phellandrene, citral and, if it has an odor of peppermint, of menthone. Broadly it may be stated that eucalyptus oil is quite closely allied chemically with ordinary turpentine. Eucalyptus oil is employed in medicine, for the preparation of certain perfumes, and in the arts. The extravagant claims sometimes made for it as a wonderful disinfectant and a panacea for lung troubles are largely without foundation as would be expected. It is useful in some cases, but its disinfecting properties are relatively slight.

EUCHARIST, n. *ū'kă-rĭst* [F. *eucharistie*—from L. and Gr. *eucharĭstĭă*, a giving of thanks—from Gr. *eu*, well; *-chăris*, favor]: the sacrament of the Lord's Supper; a giving of thanks (see LORD'S SUPPER). EU'CHARIS'TIC, a. *-kă-rĭs'-tĭk*, or EU'CHARIS'TICAL, a. *-tĭ-kăl*, pertaining to the Lord's Supper.

EUCHARIST, in the Roman Catholic Church, the sacrament of the body and blood of Jesus Christ and also the Christian covenant sacrifice. Regarding the Eucharist as a sacrament the Roman Catholic Church teaches that it is the true body and blood of Jesus Christ under the 'species' or appearances or physical properties of bread and wine. The institution of this sacrament by Christ is recorded in the three synoptic gospels and in St. Paul's first letter to the Corinthians. The name given to the sacrament comes from the expression in the original Greek text of Luke xxii. 19, εὐχαριστία (eucharistesas), 'having given thanks.' The words of institution, as given by the same evangelist, are: 'This is my body which is given for you. . . . This is the chalice, the new testament in my blood, which shall be shed for you.' The perpetuation of this sacrament is commanded in the words, 'This do for a commemoration of me' (1 Cor. xi. 24). The Roman Catholic Church teaches that in the Eucharist is contained 'truly, really, and substantially' the body and blood of Jesus Christ, together with His soul and divinity.

EUCHELAION, n. *ū-kĕ-lā'ŏn* [Gr. *euchē*, prayer; *elaion*, oil]: in *Gr. chh.*, oil with which a penitent guilty of a mortal sin is anointed by an archbishop or bishop and seven priests, in order to gain absolution.

EUCHEUMA, n. *ū-kū'ma* [Gr. *eu*, abundant; *cheuma*, that which is poured; a flood] in *bot.*, genus of rose-spored *Algæ*.

EUCHIRUS, n. *ŭ-kīr'ŭs* [Gr. *eucheir*, with good hands; handy; active; dexterous: *eu*, well developed; *cheir*, the hand: so called from the exceeding elongation of the anterior tibiæ and tarsi]: in *entom.*, the name given by Kirby to a genus of lamellicorn beetles, placed by Swainson in the family *Cetoniadæ*, sub-family *Megasominæ*.

EUCHITES, n. *ū'kīts* [Gr. *euchomai*, to pray]: in *chh. hist.*, a Christian sect which arose in the 4th c., though

some of their tenets were older than themselves. Their name was derived from their belief that there dwelt in man a demon who could be expelled only by incessant prayer and singing. They combined with this view various opinions derived partly from Manicheism, partly from the Oriental philosophy. After a time the term Euchite became a vague one, applied to all who withdrew from the Catholic Church and spent much time alone in prayer, They were called also Massalians.

EUCHLANIDOTA, n. *ū-klăn-ĭ-dō′ta* [mod. Gr. *euchlanidos*]: in *zool.*, family of rotatoria. The rotatory organs are multiple, or divided into more than two lobes; a carapace is present. There are 11 genera. EUCHLA′NIS, n. *-klā′nĭs* [Gr. *eu*, well; *chlamis*, an upper garment of wool]: in *zool.*, typical genus of the family *Euchlanidota*.

EUCHLORINE, *ū′klŏ-rĭn:* the name given by Davy to the gas produced by the action of hydrochloric acid on potassium chlorate. It consists of a mixture of chlorine and chlorine peroxide, ClO_2, in variable proportion, depending on the experimental conditions employed. It has powerful bleaching and disinfecting properties, but it is very explosive and should be handled with extreme care.

EUCHOLOGION, n. *ŭ′kŏ-lō′ĵĭ-ŏn*, or EUCHOLOGY, n. *ū-kŏl′ŏ-ĵĭ* [Gr. *euchŏlŏgĭŏn*, a prayer-book—from *euchē*, prayer, vow; *lŏgŏs*, speech, word]: a formulary of prayers; a liturgy.

EUCHRE, *yô′ker′* or *ū′kėr:* game usually played with 32 cards (all of the pack below the 7-spots being thrown out), by 2, 3, 4, and 6 persons or any number of groups of 4. Common Euchre has been extended so that the word euchre now comprises Railroad Euchre, Set-Back Euchre, Napoleon, French Euchre, and Progressive Euchre, in each of which the number of cards and players and the style of playing varies. The most popular form, known as Euchre is played by 2 or 4 persons. In the latter the players take sides as partners either by choice or by 2 matching on the cut of the cards. In 3-handed Euchre, 2 play and the third counts with the winner of each hand, each player engaging in every third hand. In Euchre the cards have the same values as in whist, in suits not trumps, ace highest, seven lowest; but in the trump suit, the knave of the suit turned up, called the *right bower*, is the highest trump, and the other knave of the same color, called the *left bower*, is the next highest. The ace of the suit ranks third, and the king and queen follow respectively. Thus, a heart is turned, or made trump, the knave of hearts is highest, knave of diamonds next, and ace, king, and queen of hearts follow. Players cut for deal; the lowest takes it, and deals to the left 2 cards around, and then 3; and turns up the first card on the pack, talon, or deck, as the remaining cards are variously known. After the first hand the deal passes on the left to each player in rotation, the cutting

between hands being by the player on the right of the dealer. The game of each hand is 5 points, represented by as many tricks. Where one side takes all 5 tricks, it has a *march*, and counts 2; 3 tricks are necessary to score 1 point; 4 tricks count no more than 3; and the failure of a player or side which takes up, orders up, or makes trump, to secure 3 tricks, is called a E., and, in common E., gives the opponent 2 points. The object of the play is to win 3 tricks or 5. When 2 play, the non-dealer decides by his hand, whether he will play or not, and either *passes* or *orders up* accordingly. If he passes, the dealer may take up the trump, discarding one card for it, or he also may pass it; but if the trump is ordered up, the dealer must obey and discard as before. If the non-dealer and the dealer pass, the latter turns the trump card over, and the non-dealer may make or designate trumps from his hand; if he again passes, the dealer may make trump; and if he declines, both hands are thrown up, and the deal passes to the next player. Where a trump is made from hand, the game proceeds the same as where it is turned up, the non-dealer leads, the dealer plays to it, and the 2 cards (where 2 are playing) constitute a trick; the second player must follow suit if able; if not, he may trump or *throw away*, i.e., play any card he pleases. The highest card of the suit led wins the trick; trumps win other suits; and the winner of the trick leads. In 4-handed E., the partners sit opposite each other. If the first hand passes, the second may *assist*, which means that the dealer (the partner) is to take up the trump. The hand is then played, the player to the dealer's left having the lead, and each playing a card in turn. In this form of the game 4 cards constitute a trick. When a player has a hand with which he believes he can win all the tricks, he may *play alone*, i.e., single-handed, against the two opponents; he also can do so when he or his partner orders up, when his partner offers to assist, or when he takes up or makes a trump. If he succeeds he scores 4 points, if euchered his opponents score 4. Sometimes, as in Railroad E., when a player determines to play alone, one of his opponents agrees to play alone also, and the game is finished by the two players. A dealer or maker of trumps, or the partner of a dealer, may call for his partner's best card, and play alone after discarding, winners and losers scoring 4 as the game results. PROGRESSIVE EUCHRE is a recent development of the game of E., so formulated that a large number of ladies and gentlemen can play it at one time. Progressive E. has become one of the most popular society diversions, and is made the basis for evening parties, with the accompaniments of prizes, music, etc. The game is played the same as four-handed E., with 5 points. Each group of four players occupy a table; hence, if there are 40 players there must be 10 tables. The hostess hands each player a favor, which, attached to the dress or coat, designates the table at which first he or she must sit. When all the company are seated, the game begins at each table at the tap of a bell, and when that at the first table is finished each stop playing at another tap. The successful players at

the first table retain their seats till after the second game, and the unsuccessful ones are transferred to the last table, at each game the losing partners are moved to the last tables, and the winning ones advance from first to second, third, fourth, etc. Victors add a star, and losers a booby, or green label, to their favors. Various kinds of prizes are provided for the winners of the largest number of honors, gold labels, or stars, as well as for those who receive the largest number of green or booby labels.

EUCHROITE, n. *ū'krō-īt:* a bright green mineral of vitreous lustre; its hardness 3·5 to 4; its sp. gr. 3·39. Composition: arsenic acid 32·42 to 34·42; oxide of copper 46·97 to 48·09; water 18·80 to 19·31.

EUCHRONE, n. *ū'krōn* [Gr. *euchroos,* well colored; *eu,* well; *chrōs,* color]: in *chem.,* dark blue insoluble substance formed when zinc is added to an aqueous solution of euchroic acid.

EUCHYMY, n. *ū'kĭ-mĭ* [Gr. *euchumia; eu,* well; *chumos,* juice; chyme]: in *med.,* a good state of the fluids in the body.

EUCHYSIDERITE, n. *ū-kĭ-sĭd'ėr-īt:* same as pyroxene (q.v.)

EUCLASE, n. *ū'klās* [F. *euclase*—from Gr. *eu,* well; *klāein,* to cleave]: prismatic emerald, a fine green mineral found in Brazil and Peru.

EUCLEA, n. *ū'klĕ-a* [Gr. *eukleia,* good fame; glory; *eu,* good; *kleos,* glory: named from its evergreen foliage]: in *bot.,* genus of *Ebenaceæ,* from Africa.

EUCLID, *ū'klĭd:* sometimes called the father of mathematics; b. Alexandria, about B.C. 300. We know little more of his history than that he belonged to the Platonic school of philosophy, and taught mathematics in the famous school of Alexandria, during the reign of Ptolemy Soter. Though he did not create the science of mathematics, as is sometimes represented, he made prodigious advances, especially by his rigorous method and arrangement. In this respect he has perhaps never been excelled, and his *Elements of Geometry* at the present day hold their place as a text-book. Besides the Elements, there are extant treatises on music, optics, data, etc., ascribed to E., the authenticity of some of which is doubtful. The best editions of the whole reputed works of E. are those of David Gregory (Oxf. 1703) and Peyrard (3 vols. Par. 1814–18). The oldest Greek edition of the Elements appeared at Basel 1533; the best is that of August (2 vols. Berlin 1826). Of English editions of E.'s Elements, those of Simpson and Playfair are considered best. For full account of everything connected with E. and his works, see Smith's *Dictionary of Greek and Roman Biography.*

EU'CLID, of Megara: d. abt. B.C. 424: Greek philosopher, often confounded with the mathematician of the same name. He was one of the earliest disciples of Socrates. Although Megara lay at a considerable distance from Athens, and all Megarians were forbidden to enter the

Athenian territories under pain of death, E. came into the city in the evening in female disguise, to enjoy the instruction of Socrates. After the death of his master, he established a school of his own, which received the name of the Megaric School. The basis of his system was the Eleatic dogma of a one, only, universal substance, or existence. Blending with this the Socratic idea of the predominance of the moral element, E. held this one real existence to be *the good*, though it receives various names under its special manifestations.

EUCLIDIUM, n. *ū-klĭd'ĭ-ŭm* [Gr. *eu*, well; *kleidion*, a little key; *kleidoō*, I lock up: named because the pods are effectively shut]: in *bot.*, typical genus of *Euclididæ*, a family of crucifers, tribe *Pleurorhizeæ*.

EUCNEMIDÆ, n. *ū-nē'mĭ-dē* [Gr. *euknemis*, well greaved; *eu*, well; *knēmis*, a greave, a legging stretching from the knee to the ankle]: a family of beetles, tribe *Pentamera*.

EUCRASY, n. *ū'kra-sĭ* [Gr. *eukrasia; eu*, well; good; *krasis*, a mixing]: in *med.*, a well balanced temperament.

EUDÆMONISM, n. *ū-dē'mŏn-ĭzm* [Gr. *eudaimōn*, blessed with a good genius; fortunate; *eu*, good; well; *daimōn*, a spirit]: system of philosophy which places the *summum bonum* in the promotion of the welfare of humanity, and teaches that the most virtuous act of which an individual is capable is to promote the welfare of others, when welfare is thought to be synonymous with pleasure, eudæmonism becomes hedonism (q.v.). EUDÆMONIST, n. *-ĭst* [Gr. *eudaimōn*, happy]: believer in eudæmonism, EUDÆMONISTIC, a. *-ĭk*, pertaining to or of the nature of eudæmonism.

EUDIALYTE, or EUDIALITE, n. *ū-dī'a-līt* [Ger. *eudialyt* —from Gr. *eu*, easily; *dialuō*, I part asunder, I dissolve; *eu*, well; *luō*, I loosen, I dissolve, in allusion to the facility with which it dissolves in acids]: a rhombohedral red mineral of vitreous lustre, translucent or nearly so; its hardness 5.5; sp. gr. 2.90 to 3.01. Composition: silica, 45.70 to 54.10; zirconia 10.90 to 15.60; sesquioxide of manganese 1.15 to 2.93; sesquioxide of iron 6.37 to 7.86; lime 9.23 to 12.06; soda 11.40 to 13.92, etc. There are two varieties—eudialyte proper, of which the double refraction is positive, and eucolite, in which it is negative. It is found in north Greenland, Norway, and Arkansas.

EUDIOMETER, n. *ū'dĭ-ŏm'ĕ-tėr* [Gr. *eudia*, fair or fine weather; *metron*, a measure]: a graduated glass tube closed at one end, used for measuring gases, especially in gas analysis. At the closed end two platinum wires are usually sealed in air tight, so that the parts of them inside the tube are a fraction of an inch apart. By connecting the outer ends of the wires with a suitable source of electricity, a spark may be passed between the ends of the wires inside the tube. In this way certain gases may be caused to combine and, from the change in volume after combination, the quantity of gas originally

present may be ascertained with great accuracy. Thus, suppose 100 volumes of a gas consisting of oxygen, and nitrogen be mixed with 80 volumes of hydrogen in the eudiometer and a spark passed. If the gas, after the explosions, measures 90 volumes, the original mixture must have consisted of 70 volumes of nitrogen and 30 volumes of oxygen and the residual gas, after the explosion, must consist of 70 volumes of nitrogen and 20 volumes of hydrogen. The proof of this is found in the fact that 1 volume of oxygen and 2 volumes of hydrogen unite to form water, the volume of which, in the liquid state, is so small as to be neglegible. The eudiometer was originally introduced for the purpose of air analysis, because it was thought that the air must differ in composition according to the state of the weather. This, of course, is not the case, except in days of dense fog. The name eudiometer once applied has been retained. For the modes of manipulating with the eudiometer see GAS, ANALYSIS OF. EU′DIOM′ETRY, n. *-ĕ-trĭ*, the art of practice of measuring the quantity of oxygen in the air or in a gaseous mixture. More generally, gas analysis in which an eudiometer is employed. EU′DIOMET′RIC, a. *-mĕt′rĭk*, or EU′DIOMET′RICAL, a. *-rĭ-kăl*, pertaining to.

EUDIOSMEÆ, n. *ū-dĭŏs′mē-ē:* in *bot.*, tribe of *Rutaceæ*, tribe *Diosma*.

EUDOCIA, *ū-dō′shĭ-a:* wife of the Byzantine Emperor Theodosius II; d. 460–461. She was daughter of the sophist Leontius or Leon, who instructed her in the literature of Greece and Rome, in rhetoric, geometry, arithmetic, and astronomy. Her accomplishments and singular beauty were reckoned by Leontius a sufficient fortune, for at his death he left all his property to her two brothers. Eudocia appealed to the emperor at Constantinople. Pulcheria, sister of Theodosius, was interested in the maiden, and thought she would make a suitable wife for the emperor. But as Eudocia (or, more properly, Athenais, for this was her name until her baptism) had been brought up a pagan, it was necessary first to convert her. This was easily accomplished. Eudocia was married to the emperor A.D. 421. For many years, however, Pulcheria ruled in the imperial household and councils—Eudocia, according to Nicephorus, 'submitting to her as mother and Augusta;' but in 447, a quarrel broke out between them in regard to the Eutychian heresy, of which Eudocia had become a supporter. At first, Eudocia was triumphant, and Pulcheria was banished; but in a short time the emperor was reconciled to his sister, and treated Eudocia so sharply that she retired to Jerusalem, where she died. Her latter days were spent in works of piety and charity. She enriched churches, rebuilt the walls of the Holy City, and founded many monasteries and hospitals. Through the influence of the famous Simeon Stylities, she was induced to renounce Eutychianism, and become an orthodox Catholic Christian. Eudocia was a poetess of considerable merit. She wrote a poem in

heroic verse on the victory of the troops of Theodosius over the Persians, 421 or 422; a paraphrase of eight books of Scripture; a paraphrase of Daniel and Zechariah, and a poem in three books on the history and martyrdom of Cyprian and Justina. The authorship of *Homero-Centones* also has (but without sufficient reason) been attributed to her. This is a work composed of verses taken from Homer, and so arranged as to appear a history of the fall of man and of his redemption by Christ. It has been often published. EUDOCIA was the name of several other Byzantine princesses.

EUDOXIA, Byzantine empress: wife of Arcadius, emperor of the West: d. 409. She was the daughter of Banto, a Frankish general of Theodosius; and Eutropius, the eunuch, intriguing against Rufinus, chief minister of Arcadius, induced the emperor to take her to wife, instead of marrying the daughter of Rufinus, as the latter had designed. Eutropius soon after this union caused Rufinus to be put to death and succeeded him. Eudoxia, if we may believe John Chrysostom, was an infamous creature, although at one time winning his admiration and profuse acknowledgements by an open profession of religious earnestness. She was a woman of strong passions and resolute will, and when Eutropius insulted her she appealed to the weak Arcadius, who at once degraded Eutropius from all his honors, and ordered his statue in the market place of Constantinople to be destroyed. Chrysostom so vehemently inveighed against the court life of Eudoxia that she caused him to be banished in 403, but popular clamor, added to the panic caused by an earthquake, induced her to recall him. But her enmity caused his second exile in 404. She was probably sincere in her anxiety to rescue the feeble Arcadius from the dominion of a minister like Eutropius, and her best act was to bring this monster of profligacy and corruption to the end of his career.

EUDOXIA, Roman empress: daughter of Theodosius II.: b. Constantinople 422; d. about 463. She was married to her cousin Valentinian III., emperor of the West, after whose death, by the hands of emissaries of the senator Maximus, she was constrained to espouse the latter. Maximus subsequently had the folly to reveal to her the part which he had taken in the murder of Valentinian, and when the time for vengeance seemed to her to have come she invited to Italy Genseric, king of the Vandals, at whose approach Maximus was murdered. Genseric delivered Rome to pillage, and bore away with him to Africa Eudoxia and her two daughters.

EUDOXIANS, n. *ū-dŏks′ĭ-ănz:* in *chh. hist.*, followers of Eudoxius, who from A.D. 356 was bishop of Antioch, in Syria, and from 360 to his death in 370 bishop and patriarch of Constantinople. He was successively an Arian, a Semi-Arian and an Aëtian. Respecting the Trinity, he believed the will of the Son to be differently affected from that of the Father.

EUDOXUS, *ū-dŏks'ŭs*, of Cnidus: called by Cicero the prince of astronomers: lived about B.C. 366. He studied under Plato and afterward went to Egypt, where he resided 13 years, and had much intercourse with the Egyptian priesthood, from whom he is supposed to have derived his superior knowledge. His last years are said to have been spent on the summit of a high hill, that he might have the starry heavens ever before his eyes. There is little reason for believing that Eudoxus deserves great admiration for his attainments in astronomy. He probably introduced the sphere into Greece, and may have corrected the length of the year, upon Egyptian information, but he appears to have been but an indifferent observer of heavenly phenomena, and Delambre considers that he was ignorant of geometry. Eudoxus's works are entirely lost, and our only reliable sources of information regarding him are the poem of Aratus and the commentary of Hipparchus.

EUDYTES, n. *ū-dī'tēs* [Gr. *eu*, good; *dutēs*, a diver—from *duō*, I dive]: in *ornith.*, genus of *Spheniscidæ*. *Eudytes demersa* is the jackass penguin.

EUFAULA, *ū-faw'la:* city of Barbour co., Ala.; on the w. bank of the Chattahoochee river; terminus of the Montgomery and Eufaula and the Southwestern Georgia railroads; 50 m. w. of Columbus, 80 m. e.s.e. of Montgomery. The largest steamboats can ascend the river to Eufaula all the year round. The city contains several churches and banks, a public hall, fair ground, female college, school for colored children, weekly newspapers, several cotton warehouses, and carriage and furniture factories. The average sales of cotton are 30,000 bales annually. Pop. (est.) 4,600.

EUGENATE: see EUGENOL.

EUGENE, *ū-jēn'* FRANÇOIS (le Prince François-Eugene de Savoie-Carignan), better known as Prince EUGENE, general and statesman: 1663, Oct. 18—1736, Apr. 21; b. Paris; son of Eugene Maurice, Count of Soissons, and of Olympia Mancini, niece of Cardinal Mazarin. He was intended for the priesthood; but the banishment of his mother to the Low Countries by order of Louis XIV., was so deeply resented by him, that he indignantly renounced his country, and entered the service of Emperor Leopold as a volunteer against the Turks. Subsequently, the French government made him most flattering offers, but he never returned to the service of his native country. He showed extraordinary military talent in the Turkish war, especially at the famous siege of Vienna, 1683, and soon rose to a high position in the army. In the Coalition war against Louis XIV., in Italy, he was active; and 1691 he was raised to the command of the imperial army in Piedmont. On his return to Vienna, he was placed at the head of the army of Hungary, and defeated the Turks, with immense slaughter, in the famous battle of Zenta, 1697, Sep. 11. The booty obtained was almost incredible.

amounting to several millions sterling. In 1701 broke out the Spanish War of Succession. E. for two years commanded the army of Italy, but his forces were too small for any deeds of importance. In 1703, being appointed pres. of the council of war, he became thenceforth the prime mover of every undertaking. He first took command of the imperial army in Germany, and with Marlborough gained a brilliant victory at the battle of Blenheim, 1704, Aug. 13, when the two commanders defeated the French and Bavarian army. E. afterward saved Turin, and expelled the French from Italy in 1706. He shared, too, with Marlborough the glory of the fields of Oudenarde (1708) and Malplaquet (1709); but being crippled in his resources by the retirement of Holland and England from the contest, he was unable to withstand the enemy on the Rhine, and his defeat by Villars at Denain, 1712, July 24, was followed by other disasters, until the peace of Rastadt put an end to the war. In 1716, on the recommencement of the war against the Turks, E. defeated an army of 180,000 men at Peterwardein, took Temeswar, and in 1717, after a bloody battle, gained possession of Belgrade. After the peace of Passarowicz, concluded in the following year, he returned covered with glory to Vienna, where, during the succeeding years of peace, he labored with unwearied energy in the cabinet. When the question of the succession to the throne of Poland brought on a new war with France, E. appeared again on the Rhine; but being now advanced in years, and destitute of sufficient resources, he accomplished nothing of importance. After peace, he returned to Vienna, where he died. E. was small in stature, with thin face, and long nose; he was simple in dress and manner, and indulged profusely in snuff. An enthusiast in his profession, and a strict disciplinarian, he was also kind-hearted and sympathetic, and always carefully attended to the wants of his men. He introduced no new tactics in the art of war, and was deficient in the guidance and command of masses; but by his rapidity of perception and decision, and faculty for making the best of existing circumstances, which was his *forte*, he raised the *prestige* of the Austrian arms to an eminence unequalled before or since. He served successively under three emperors, of whom he was wont to say, that in Leopold I. he had a father, in Joseph I. a brother, and in Charles VI. a master. E.'s political writings, published by Sartori, are important for the light that they throw on the history and the manners of the time. Compare Dumont, *Histoire Militaire du Prince Eugene;* Ferrari, *De Rebus Gestis Eugenii* (Rome 1747); Campbell's *Military History of Prince Eugene and the Duke of Marlborough;* and the monographs of Kausler (1838), Arneth (1858), and Von Sybel (1861).

EUGENESIS, n. *ū-jĕn'ĕ-sĭs* [Gr. *eu*, well; *genesis*, origin; source]: quality of breeding well or freely; production of young by the union of individuals of different species or stocks

EUGENIA, *ū-jē'nĭ-â:* genus of plants of the nat. ord. *Myrtaceæ*, nearly allied to *Myrtus* (see MYRTLE), and differing only in having a 4-parted instead of a 5-cleft calyx, four instead of five petals, and a 1–2-celled berry, with one seed in each cell. The species are trees and shrubs, natives chiefly of tropical and sub tropical countries. The dried fruit of *E. Pimento* and *E acris* forms the spice well known as allspice, Jamaica pepper, or PIMENTO (q.v.). The seeds of *E. Tabasco* also are used as a condiment. Other species yield some of the finest fruits of tropical regions, remarkable for their delicious balsamic odors. Among these is the MALAY APPLE (*E. Malaccensis*), native of the Malayan archipelago and of the South Sea Islands, a low tree, with ovate-oblong smooth leathery leaves, and fruit in size and shape resembling a small apple, of a beautiful red color, and with a white juicy pulp. This fruit has an agreeable odor, like that of the rose, whence it is sometimes called ROSE APPLE; a name which, on the same account, is often extended to the fruits of allied species, as *E. aquea*, and very often given to the JAMBOS or JAMROSADE (*E. Jambos* or *Jambosa vulgaris*), an E. Indian fruit, now cultivated in all tropical countries. This fruit is pear-shaped, about the size of a hen's egg, white or red. The tree is 20 or 30 ft. high, much branched, with leaves somewhat like those of the peach, and greenish-yellow flowers in terminal bunches. *E. cauliflora*, a Brazilian species, cultivated in most of the gardens of the diamond and gold districts of the south of Brazil, yields a very fine fruit of a black color, about the size of a greengage plum, called the JABUTICABA or JABOTICABUROS. Similar fruits are produced by other Brazilian species, particularly *E. dysenterica*, *E. inocarpa*, and *E. Brazilien-sis.* The BASTARD GUAVA (*E. pseudopsidium*) and the

Cayenne Cherry (*Eugenia Michelii*).

CAYENNE CHERRY (*E. cotonifolia* and *E. Michelii*) produce fruits which are held in considerable esteem in the W. Indies. One species only, the UGNI (*E. Ugni*), native of Chili, appears to be sufficiently hardy for the climate of

southern temperate regions: it has been recently introduced into the south of England, and much extolled as a fruit shrub. Its flowers are very fragrant, and its fruit pleasant. It is much cultivated in Chili; and a refreshing beverage, with an agreeable balsamic odor, is made of the expressed juice mixed with water. The fruit is of the size of a black currant, somewhat flattened, and of a brownish red color. The bark of many species of Eugenia is very rich in tannin. Some produce good timber.

EUGENIACRINIDÆ, n. *ū-jĕn-ĭ-ă-krī nĭ-dē* [L. *eugenius; crinon,* a lily]: in *paleon.*, family of *Crinoidea.* Range in time, from the Oolite to the Chalk. Eugeniacrinus is the type.

EUGENIC, a. *ū-jĕn′ĭk:* obtained from or relating to cloves. EUGENIC ACID: see EUGENOL.

EUGENICS: the attempt to improve the human race by providing for the marriage of the fittest; stirpiculture as applied to man.

EUGENIE-MARIE DE GUZMAN, *ŭh-zhā-nē′-mâ-rē′ dâ gôth-mân′:* Empress of the French: b. Granada in Spain, 1826, May 5; second daughter of the Count of Montijo and of Marie Manuela Kirkpatrick; descendant, on the father's side, from an old and noble Spanish family, which, by marriages at various times, acquired the right to assume the names of Guzman, Fernandez, Cordova, La Cerda, and Levia, and contracted alliances with the noble families of Téba, Banos, and Mora. By her mother—also born in Spain, and the daughter of Mr. Kirkpatrick, some time English consul at the Spanish seaport of Malaga—she is connected with an ancient Scottish family—the Kirkpatricks of Closeburn—which still exists, but no longer in possession of their original property. She was educated principally at Madrid, and spent a great portion of her youth in travelling with her mother, under the name of Countèss de Téba. In 1851, she appeared at the *fêtes d'Elysée* in Paris, where her beauty and graceful demeanor attracted the notice and excited the admiration of Emperor Louis Napoleon, who married her 1853, Jan. 30, at Notre Dame. On that occasion an amnesty was granted to 4,312 political prisoners. In 1859, Eugenie filled with ability the office of regent. During the Franco German war in 1870, she was again regent, but had to flee to England after the emperor became a captive. Her only son, the prince imperial, b. 1856, Mar. 16, completed his military education in England, and was killed 1879 while serving as a volunteer in the Zulu war, in s. Africa.

EUGENIN, n. *ū′jĕn-ĭn:* in *chem.*, clove camphor, a crystalline substance deposited from water which has been distilled from cloves. Nitric acid turns it blood red.

EUGENIUS, *ū-jē′nĭ-ŭs,* IV., Pope: began pontificate 1431; d. 1447; b. Venice. The great event in his career was the schism created in the church by the proceedings of the Council of Basel, which had been convoked by Eugenius's predecessor, Martin V., and showed strong tendency to

ecclesiastical reform. Eugenius was kept in perpetual trouble by this council, and at last, having been compelled to flee from Rome, opened a new council at Ferrara, 1438, and issued a bull of excommunication against the bishops assembled at Basel, whom he pronounced to be 'a satanic conclave, which was spreading the abomination of desolation into the bosom of the church.' The result was, that the Council of Basel formally deposed him from his pontifical office 1439, and elected in his stead Amadeus VIII., Duke of Savoy, under the title of Felix V. The conduct of France and Germany seemed to warrant this bold step, for Charles VII. had introduced into the former country the decrees of the Council of Basel, with some modifications through the Pragmatic Sanction (1438), and the same thing happened in Germany by means of the Deed of Acceptance (1439). At the Council of Ferrara, John Paleologus II. Emperor of Constantinople, and more than 20 Greek bishops, presented themselves, and a union between the two great divisions of Christendom —the Greek and Latin Church—was for a moment effected, 1439, July. Discord, however, broke out almost immediately, and the two have ever since remained separate. Eugenius's rival, Felix, did not attain much recognition, and after the death of Eugenius at Rome he had to give way in favor of Nicholas V.

EUGENOL, n. *ū′jĕn-ŏl* [mod. L. *eugenia*: Eng. *alcohol*]: $HOC\begin{matrix}\langle CH.C(OCH_3) \\ CH:CH\text{——}\end{matrix}\rangle CCH_2CH:CH_2$, a colorless oil with a spicy odor which rapidly resinifies on exposure to air. It has a burning taste and boils at 252°C. It is the chief constituent of oil of cloves, oil of bay, oil of cinnamon leaves, oil of pimento and is contained in the oils of *Canella alba* and of *Ilicum religiosum*. It may be made artificially.

EUGLENA, n. *ū-glē′nă* [Gr. *euglēnos*, bright-eyed; *eu*, well, bright; *glēnē*, the pupil of the eye, the eye ball]: in *bot.*, microscopic and animal-like plant. It is locomotive, with a red-eye speck, a tail-like process, and a single flagelliform filament. The species or forms are present in some pools to such an extent as to render the water green or red, and form a brilliant pellicle on the surface. The coloring matter is insoluble in water, but is soluble in alcohol, from which it crystallizes in octohedra.

EUGUBINE TABLES, *ū′gū-bīn* [Lat. *Tabulæ Eugubinæ*]: seven bronze tablets, the inscriptions on which present a comprehensive and very remarkable memorial of the Umbrian language. They were discovered 1444 at Gubbio (anc Iguvium or Eugubium), where they are still preserved. The characters on four of the tablets are Umbrian, on two Latin, and on one partly Latin and partly Umbrian. The *language* employed, however, is in all cases the same, and differs both from Etruscan and Latin, but resembles somewhat the older forms of the latter, and also the Oscan dialects, so far as we know them. The subjects of the inscriptions are directions concerning sacrificial usages and forms of prayer, and they seem to have been inscribed three or

four centuries before the Christian era. Philip Bonarota first published them in complete form in Dempster's *Etruria Regalis* (2 vols. Florence 1723–4). The first really judicious attempt at interpretation was that of Lanzi, in his *Saggio di Lingua Etrusca* (3 vols. Rome 1789), who points out the important fact that they related to sacrificial usages, etc. His views have been carried out by Ottfried Müller in *Die Etrusker;* Lepsius, *De Tabulis Eugubinis*, etc. The most accurate copy of the inscriptions is given by Lepsius in *Inscriptiones Umbricæ et Oscæ* (Leip. 1841); the best and most complete work on the language and contents of the tablets is that of Aufrecht and Kirchhoff, *Die Umbrischen Sprach. Denkmäler* (1849–51).

EUHARMONIC, a. *ū-har-mŏn'ĭk* [Gr. *eu,* well; good; *harmonikos,* harmonic]: in *mus.*, producing perfect harmony or concord; used to distinguish concordant sounds from those produced by the tempered scale.

EUHEMERISM, n. *ū-hĕm'ĕr-ĭzm* [Gr. *Euēmĕros:* L. *Euhēmĕrus,* a Greek writer, B.C. 316, who treated myths as dressed-up plain histories]: system of mythological interpretation which reduces the gods of old to the level of distinguished men, and considers the myths as founded on real histories (see MYTH). EUHEM'ERIST, n. *-ĭst,* one who believes in or maintains these views. EU'HEMERIS'TIC, a. *-ĭs'tĭk,* pertaining to.

EUKAMPTITE, n. *ū-kămp'tīt* [Gr. *eukamptēs,* well bent or curved; *eu,* well; *kamptō,* I bend, I curve]: in *mineral.*, according to Dana, a hydrous variety of biotite.

EULENSPIEGEL, TYLL: see OWLGLASS.

EULER, *yō'lĕr,* LEONARD: 1707, Apr. 15—1783, Sep. 7; b. Basel: one of the greatest of mathematicians. He received his first instructions in mathematical science from his father, pastor of the neighboring village of Riechen. At the Univ. of Basel, he studied under John Bernouilli, and was the friend of Daniel and Nicholas Bernouilli. At the age of 19, he was second in the contest for a prize offered by the Acad. of Paris for the best treatise on the masting of ships. His friends, the Bernouillis, had been called to St. Petersburg by Catharine I., when she founded the Acad., and they now induced E. to settle in that capital, 1730, as prof. of physics. Three years later, he exchanged his professorship for a place in the Academy. From that time, he continued to labor in mathematics with astonishing ardor. More than half the mathematical treatises in the 46 quarto vols. published by the St. Petersburg Acad. 1727 to 83 are by E., and at his death he left more than 200 treatises in MS., afterward published by the Academy. The Paris Acad. of Science awarded him the prize on ten several occasions, one of which was his treatise on Tides, 1740. In 1741, he accepted the invitation of Frederick the Great to Berlin. He returned to St. Petersburg 1766, where he was made director of the mathematical dept. of the Acad., and where he died. The last years of his life were spent in total blindness.

E. was amiable and religious, always cheerful and good

humored; in society, he was distinguished for agreeable wit. It was doubtless his residence in St. Petersburg that led him to the application of mathematics to the building and management of ships, as embodied in his *Théorie de la Construction et de la Manœuvre des Vaisseaux* (Petersb. 1773). The great problems left by Newton to his successors were the objects of his unceasing research. On physical subjects, E. often adopted extremely untenable hypotheses. He occupied himself also with philosophy in the proper sense of the word. He undertook to prove the immateriality of the soul, and to defend revelation against free-thinkers. In his *Lettres à une Princesse d'Allemegne sur quelques Sujets de Physique et de Philosophie* (3 vols. Berl. 1768; new ed. Par. 1812; translated into English), he attacked Leibnitz's system of monads and of a pre-established harmony. But this was not the field in which he was best fitted to shine; his proper domain was the abstruser parts of pure mathematics. His most important works of this class are *Theory of Planetary Motion, Introduction to the Analysis of Infinites, Institutions of the Differential and of the Integral Calculus,* and *Dioptrics;* all, as well as *Opuscula Analytica,* in Latin. His *Introduction to Algebra* is well known.

EULOGY, n. *ū'lō-jĭ* [Gr. *eulŏgĭă*, good language, praise —from *eu*, well; *logos*, a discourse]: the praise of any one, written or spoken; encomium; praise. EULOGIC, a. *ū-lŏj'ĭk*, or EULOG'ICAL, a. *-ĭ-kăl*, containing praise. EULOG'ICALLY, ad. *-lĭ*. EULOGISTIC, a. *ū'lō-jĭs'tĭk*, or EU'LOGIS'TICAL, a. *-tĭ-kăl*, containing praise; commendatory. EU'LOGIS'TICALLY, ad. *-lĭ*. EULOGIUM, n. *ū-lō'jĭ-ŭm*, praise; commendation; panegyric; eulogy. EULOGIZE, v. *ū'lō-jīz*, to praise highly; to extol. EU'LOGI'ZING, imp. EU'LOGIZED, pp. *-jīzd*, praised. —SYN. of 'eulogy': panegyric; applause; eulogium.

EULOPHIA, n. *ū-lŏf'ĭ-a* [Gr. *eulophos*, well plumed; *eu*, well; *lophos*, the back of the neck, the crest of a helmet: named because the labellum bears elevated lines or ridges]: in *bot.*, genus of orchids, tribe *Vandeæ*, family *Sarcanthidæ*.

EUMANITE, n. *ū'man-īt* [Gr. *eu*, very; *manos*, scanty, scarce]: in *mineral.*, a variety of brookite found in minute crystals at Chesterfield, Mass., in an albite vein.

EUMENES, n. *ū'mĕn-ēz* [Gr. *Eumenes* as a Greek proper name, borne by various kings; as adjective, *eumenēs*, well disposed, gracious; *eu*, well; *menos*, temper, disposition]: in *entom.*, typical genus of the family *Eumenidæ*. The genus, which is extensive, consists of large and, as a rule, gaily colored insects, with a very long petiole and a pyriform abdomen. EUMEN'IDÆ, n. *-ĭ-dē*, family of solitary wasps akin to the *Vespidæ*, in which they are sometimes merged.

EUMENIDES, *ū-mĕn'ĭ-dēz* [Gr., literally, the well-minded or benign goddesses]: euphemistic name of certain fearful beings, whose true name of Erinnys, or Erinnyes, it was considered unlawful to utter. Their Latin name was *Furiæ* or *Diræ*. They are mentioned by the earliest poets,

and they play a prominent part in the writings of the tragedians, where their sphere of action is much extended. In the earliest times, Homer and Hesiod represent them as avenging and punishing perjury and murder, and the violation of filial duty and of the rite of hospitality; they were regarded also as goddesses of Fate (like the Parcæ), and had a share in the grim Providence which led the doomed ones into the way of calamity. A part of their function was also to hinder man from acquiring too much knowledge of the future. In these poets, their number is sometimes undefined; sometimes they appear as one. The limitation to the number three, as well as their names Alecto, Megæra, and Tisiphone, is of a later period, a whole chorus of Erinnyes appearing in the writings of Æschylus. According to Homer, they dwelt in Erebus, and with this the duration after death of the punishments which they inflict is connected. Hesiod calls them the daughters of Ge and Uranus. Æschylus describes them as having the features of gorgons and harpies, their bodies covered with black, serpents twined in their hair, and blood dripping from their eyes. The later poets and sculptors represented them in the more pleasing form of winged virgins, attired in the garb of huntresses, bearing torches in their hands, and with a wreath of serpents round their heads. Gradually, they came to be considered goddesses of the infernal regions, who punished crimes after death, but seldom appeared on earth. In Athens, their worship, which like that of the other infernal deities, was conducted in silence, was held in great honor. The sacrifices offered to them were black sheep and libations of *nephalia*—i.e., honey mixed with water. The turtle-dove and the narcissus were sacred to them. They had a sanctuary in the vicinity of the Areopagus, and one at Colonus.

EUMIMOSEÆ, n. *ū-mī-mō'sē-ē:* in *bot.*, typical tribe of the sub-order *Mimoseæ.*

EUMOLPUS, *ū-mŏl'pŭs* [Gr. 'sweet singer']: in the later mythology of Greece, son of Poseidon and Chione. He was brought up in Ethiopia, whence he went to Thrace, and afterward passed into Attica at the head of a body of Thracians, to assist the Eleusinians in their war against Erechtheus, King of Athens. E. and his sons are said to have been slain in battle. He is spoken of as the founder of the Eleusinian mysteries. A distinction is made by some of the ancient writers between this E. and a son of Musæus bearing the same name. The latter is represented as a scholar of Orpheus, and the instructor of Hercules; but E.'s history, like all mythological stories, is involved in great obscurity and confusion The name of E. is one of the series of those old priestly singers who, by the institution of religious ceremonies, spread culture and morality among the rude inhabitants of Hellas. An illustrious Athenian family, the *Eumolpidæ,* derived their descent from E., and held the office of priests of Demeter in Eleusis.

EUNICE, n. *ū-nī'sē* [Gr. *Eunikē*, Eunice, Gr. female proper name; *eu*, well, good; *nikē*, conquest, victory]: in

zool., typical genus of the family *Eunicidæ* or the tribe *Euniceæ*. *Eunice gigantea*, is a sea-centipede, sometimes as long as four ft., and consisting of above 400 rings. It is found in the ocean adjacent to the W. Indies.

EUNICIDÆ, n. *ū-nĭs'ĭ dē*, or EUNIC'EÆ, n. *-ē-ē:* in *zool.*, family or tribe of errant annelids with large branchial tufts, and from seven to nine toothed jaws.

EUNOMIUS, *ū-nō'mĭ-ŭs:* b. in the village of Dacora, Cappadocia; d. 394: founder of the Arian sect of Eunomians. He was first a lawyer, then a soldier, ultimately took holy orders, and in 360 was appointed bp. of Cyzicum. In the great controversy in the 4th c. regarding the Trinity, E. was conspicuous by his advocacy of the view that the Father alone was eternal and supreme; that the Son was generated of Him; and the Holy Spirit, again, of the Son. His doctrine of the Trinity is sometimes called the *Anomoian* ('dissimilar'), to distinguish it, on the one hand, from the *Homoiousian* ('similar'), held by the semi-Arians, and, on the other, from the *Homoousian* ('identical'), held by the Athanasian or Trinitarian party. It was thus the extreme of Arianism, now known as the Unitarian view. In defense of his peculiar views, E. is said to have shown superior ability, though his opponents accuse him of being verbose and inflated in his style. His life was much checkered. He was banished from one place to another, until at length he obtained permission to retire to his native village, where he died. His writings have entirely perished, with the exception of a fragment here and there preserved in the writings of his adversaries.

EUNUCH, n. *ŭ'nŭk* [Gr. *eunouchos*, one who is castrated —from *eunē*, a bed; *ĕchō*, I have or keep: L. *eunūchus;* It. *eunuco;* F. *eunuque*, a eunuch]: the barbarous practice of employing castrated males as guardians of the other sex, is an accompaniment of polygamy, therefore found chiefly in the East and in n. Africa. When it has appeared in countries where monogamy was the law, it was in consequence of the introduction of oriental luxury, as under the Roman emperors. The practice is of great antiquity, and seems to have originated in Libya, and from that to have spread to Egypt and the East. Syria and Asia Minor were the most notorious in this respect. In Greece, it never obtained prevalence; for though Greek women were kept in seclusion, polygamy itself never prevailed. The later Romans kept eunuchs, but they were mostly imported. In the Byzantine empire, on the contrary, castration and keeping of eunuchs, were very prevalent. This class were prominent in the court of the Eastern Empire, and the word E. came to be the title of an office similar to that of chamberlain. In modern times, the practice is confined mostly to Mohammedan countries, and the eunuchs are brought chiefly as slaves from the interior of Africa. EU'NUCHATE, v. *-āt*, to make a eunuch EU'NUCHATING, imp. EU'NUCHATED, pp. EU'NUCHISM, n. *-ĭzm*, the state of a eunuch.

EUOMPHALUS, n *ū-ŏm'fă-lŭs* [Gr. *eu*, well; *ŏmphălŏs*,

the navel, the boss of a shield]: large genus of fossil gasteropodous shells, characterized by its depressed and discoidal shell, with angled or coronated whorls, five-sided mouth, and very large umbilicus. The operculum was shelly, round, and multi-spiral. The genus seems related to *Trochus*. It appears among the earliest tenants of the

Euomphalus Discors.

globe, and keeps its place till the Triassic period. No less than 80 species have been described. The figure represents one from the Wenlock limestone.

EUONYMUS, n. *ū-ŏn'ĭ-mŭs* [L. *Euonyme;* Gr. *Eunomia*, mother of the Furies, in allusion to the poisonous character of the berries]: spindle-tree; genus of trees, order *Celastraceæ*. About forty species are known. EUONYM'EÆ, n. *-ō-nĭm'ē-ē*, tribe of *Celastraceæ*, having capsular fruit. See SPINDLE TREE.

EUOSMITE, n. *ū-ŏs'mīt* [Gr. *cu*, well; *osmē*, odor]: a fossil resin, so called from its strong, peculiar, and pleasant odor.

EUOTOMOUS, a. *ū-ŏt'o-mŭs* [Gr. *eu*, well; *temnō*, I cut]: in *mineral.*, cleaving readily; having distinct cleavages.

EUPATORIA, *ū-pā-tō'rĕ-ā*, (formerly *Koslov*): thriving maritime town of Russia, govt. of Taurida; on a bay in the w. coast of the Crimea, 15 m. n.w. of Old Fort, 40 m. n.w. of Simferopol. The town stands on the border of a monotonous pastoral steppe, and is surrounded by low hills. Seen from the sea, it presents, with its occasional minarets and its houses roofed with red tiles, a picturesque appearance. The principal building is the Tartar mosque, built by Devlet-Ghiri Khan 1552, and reckoned the finest in the Crimea. E. exports corn, wool, and salt. Its harbor is shallow, sheltered only from the n. and n.e. winds. The people, mostly Crim-Tartars and Jews, are engaged chiefly as farmers and shepherds, and possess an immense number of oxen and sheep, and a large area of badly cultivated land. Pop. est. 13,416.

EUPATORIUM, *ū-pa-tō'rĭ-ŭm:* genus of plants of the nat. ord. *Compositæ*, sub-order *Corymbiferæ*, having small flowers (heads of flowers) in corymbs, florets all tubular and hermaphrodite, club-shaped stigmas, imbricated bracts, a naked receptacle, and a hairy pappus. The species are numerous, and mostly American.—THOROUGH-WORT (*E. perfoliatum*), a species having the opposite leaves joined at

the base, is very common in low grounds in N. America, and is a popular medicine, much esteemed and used. It is often administered in intermittent fevers. It acts powerfully as a sudorific, and is very beneficial in catarrh and influenza. It is also emetic and purgative, and, in small doses, tonic. The whole plant is very bitter.--Other N. American species have similar properties, and the

Hemp Agrimony (*Eupatorium cannabinum*): *a*, a floret.

root of one, GRAVEL-ROOT (*E. purpureum*), is employed as a diuretic for relief of the disease from which it derives its name.—The AYAPANA (*E. Ayapana*), a half-shrubby species, native of the n. of Brazil, has high reputation in that country as a cure for snake-bites, and has been introduced into the E. Indies. It is a very powerful sudorific, and is also diuretic.—The famous Peruvian vulnerary, MATICO, has been referred, but uncertainly, to a shrubby species of this genus, *E. glutinosum*.—GUACO or HUACO, much valued in Peru as a cure for snake-bites, is supposed to belong to the allied genus *Mikania*. See AGRIMONY.

EUPATRID, n. *ū-păt'rĭd* [Gr. *eupatridēs*, of a good or noble father, of noble birth; *eu*, well, good; *patēr*, a father]: in *Gr. antiq.*, a member of the *Eupatridæ*, or aristocracy of Athens, in whom was vested the whole power of the state. EUPAT'RIDÆ, n. *-rĭ-dē*, plural of Eupatrid.

EUPEN, *oy'pĕn:* flourishing manufacturing town of Rhenish Prussia in a beautiful valley on the Weeze, within 2 m. of the Belgian frontier, 9 m. s.s.w. of Aix-la-Chapelle. It is well built and open, including within its limits several gardens and meadows. There are four churches—three Rom. Cath., one Prot., also a convent, a high-school, and an orphan-house. E. has the most flourishing woolen manufactures of any town in Prussia, and has also dye-works, machine-making, and

other manufactures. It owes the prosperity of its manufactures chiefly to a number of French refugees, who settled here after the peace of Lunéville. Pop. (1880) 15,033; (1890) 15,445.

EUPEPSY, n. *ū-pĕp'sĭ* [Gr. *eu*, well; *peptō*, I cook, I digest]: good digestion. EUPEP'TIC, a. *-tĭk*, pertaining to.

EUPHEMA, n. *ū-fē'ma* [Gr. *euphēmos*, auspicious; *eu*, well, good; *phēmē*, fame]: in *ornith.*, a genus of *Psittacidæ*, sub-family *Pezoporinæ* (parrakeets, or parroquets). It contains some of the beautiful little grass parrakeets of Australia.

EUPHEMISM, n. *ū'fĕm-ĭzm* [Gr. *euphēmismos* for *euphēmĭă*, the use of words of good omen—from *eu*, well; *phēmī*, I speak: F. *euphémisme*]: substitution of a delicate or indirect expression in order to avoid something offensive to good manners, or indelicate; a mild name for something offensive. EU'PHEMIS'TIC, a. *-ĭs'tĭk*, rendering less offensive or more delicate.

EUPHON, *ū'fon*, or EUPHONON, *ū'fo-nŏn:* musical instrument invented by Chladni 1790; its tone, like that of the harmonica, is produced from the sounding body by the finger direct, without mechanism, and is regulated in quality and effect by the taste and feelings of the performer, who can produce tones from the most delicate pianissimo to fortissimo. In 1822, Chladni exhibited an improved E., of which a detailed description is given by himself in the Leipsic *Musik-zeitung* of that year, page 805.

EUPHONIA, n. *ū-fō'nĭ-a* [Gr. *euphōnia*, symphony; *eu*, well, good; *phōnē*, sound, voice]: in *mus.*, sweet sound; a consonant combination of sounds; in *ornith.*, a genus of *Fringillidæ*, sub-family *Tanagrinæ* (tanagers). *E. musica* is the organist tanager of the W. Indies, a small bird which sings well. The plumage of the male is mostly black and orange. EUPHONIAD, n. *ū-fō'nĭ-ăd*, in *mus.*, instrument in which are combined the characteristic tones of the organ and other instruments. EUPHONIUM, n. *-ŭm* [Gr. *euphōnos*, harmonious or pleasant in sound]: in *mus.*, brass bass instrument, properly belonging to a military band, but frequently introduced into the orchestra as a substitute for the third or bass trombone, to the tone of which the sound of the euphonium has not the slightest affinity.

EUPHONY, n. *ū'fō-nĭ* [Gr. *euphōnĭă*, euphony—from *eu*, well; *phōnē*, a voice: F. *euphonie*]: an agreeable sound of words; a pronunciation of words or syllables pleasing to the ear. EUPHON'IC, a. *-fŏn'ĭk*, or EUPHON'ICAL, a. *-ĭ-kăl*, agreeable in sound. EUPHO'NIOUS, a. *-fō'nĭ-ŭs*, pleasing to the ear. EUPHO'NIOUSLY, ad. *-lĭ*. EUPHONIZE, v. *ū'fō-nīz*, to render agreeable in sound. EU'PHONIZING, imp. EU'PHONIZED, pp. *-nīzd*. EUPHONICON, n. *ū-fŏn'ĭ-kŏn*, an improved pianoforte; also EU'PHONON, n. *fo-nŏn*.

EUPHORBIA, n. plu. *ū-fŏr'bĭ-ă* [Gr. *euphŏrbĭŏn*, a certain gum-resin—from *Euphorbos*, an anc. Greek physician]: genus of plants of many species, yielding an acrid milky juice, ord. *Euphorbĭācĕæ*. OIL OF EUPHORBIA, or OIL of

CAPER SPURGE, an extremely acrid fixed oil, obtained by expression, or by the aid of alcohol or ether, from the seeds of the Caper Spurge (*Euphorbia Lathyris*), a plant common in many parts of Europe: see SPURGE. Oil of euphorbia has much resemblance to croton oil in its properties, though less powerful, and is sometimes used as a substitute for it, in doses of from three to ten drops. It is good for use only when recently extracted. EUPHORBIA'CEÆ, n. *-bĭ-ā'cē-ē*, very extensive nat. ord. of oxogenous plants, con-

Caper Spurge (*Euphorbia Lathyris*).

taining more than 2,500 known species—trees, shrubs, and herbaceous plants. They abound chiefly in warm countries, most of all in tropical America. The few species found in the colder parts of the world all are herbaceous. The common Box reaches a more northern limit than any other shrubby species. The Euphorbiaceæ usually abound in an acrid and poisonous milky juice; though there are species of which the juice is bland or becomes bland through the application of heat, so that their leaves may be used as food. The leaves in this order exhibit great diversities. The inflorescence also is various. Among those most remarkable for acridity of juice are the MANCHINEEL (q.v.) and *Excœcaria agallocha*, an E. Indian tree—formerly supposed to yield one of the kinds of aloes-wood—the smoke from the burning of which is extremely dangerous to the eyes. The juice also of many of the spurges is very acrid Many Euphorbiaceæ are valued for their medicinal properties, different parts of the plant being in some instances used, and in some the resins and oils which they yield. Thus the juice of some of the spurges, the roots or bark of the roots of others, the bark of different species of *Croton* (Cascarilla Bark, Copalche Bark), etc., are used in medicine; and to plants of this order we are indebted for euphorbium, oil of euphorbia-castor oil, croton oil, etc. A few Euphorbiaceæ yield balsamic

products of exquisite fragrance (see CROTON); a few, though their juice is poisonous, yield a wholesome starch in considerable abundance (see MANIOC); a few are cultivated and used as pot-herbs, particularly species of *Plukenetia* in the E. Indies; a few yield wholesome and agreeable sub-acid fruits, as *Cicca disticha* and *C. racemosa* in the E. Indies; the seeds of some are eatable, as those of the Candle-nut (q.v.), of *Omphalea diandra*, a Jamaica tree, and of *Conceveiba Guianensis*, the latter being esteemed particularly delicious; the oil of the seeds also is in some cases used for food, like other bland oils (see CANDLE-NUT); but it is used more frequently for burning, as castor oil, candle-nut oil, the oil of *Elæococca verrucosa* in Japan and Mauritius, and the concrete oil of *Stillingia sebifera*, used in China for making candles, and in medical preparations as a substitute for lard.—The dye-stuff called TURNSOLE (q.v.) is obtained from a plant of this order; and a bright red is imparted to silk by the roots of *Rottlera tinctoria*, native of Circassia, and by a red powder with which its seed-vessels are covered. The timber of some of the Euphorbiaceæ is valuable. African Teak (q.v.) belongs to this order. The red-colored wood of *Stylodiscus trifoliatus* is used in Java for making masts. Some Euphorbiaceæ are often cultivated in gardens and hot-houses, more for their curious appearance than for their beauty; but the large deep crimson bracts of *Poinsettia pulcherrima*, native of Madagascar, make it a very attractive plant. EUPHOR'BIUM, n. *-bĭ-ŭm*, extremely acrid gum resin, obtained from several species of *Euphorbia* or SPURGE (q.v.) as *E. officinarum* and *E. antiquorum*, in n. Africa, Arabia, and the E. Indies; and *E. Canariensis* in the Canary Islands. It is obtained by incisions in the branches, whence issues a corrosive milky juice, which dries in the sun, and becomes a yellowish-gray waxy gum resin. The persons who collect it are obliged to defend their mouths and nostrils by a cloth, as its particles produce incessant sneezing, violent inflammation of the nostrils, and a very painful burning sensation in the mouth. On account of its excessive acridity, it is now less used in medicine than formerly; though it is still occasionally mixed with Burgundy pitch or other substances to make rubifacient plasters for chronic affections of the joints; its alcoholic tincture is used as a caustic in carious ulcers, and its powder, mixed with much starch or flour, as an *errhine* in chronic affections of the eyes, ears, or brain. It was formerly administered as an emetic and drastic purgative, but is dangerously violent in its action.

EUPHRANOR, *ū-frā'nor:* abt. B.C. 365–325; b. Corinth: Greek painter and sculptor. He is said to have been a pupil of Ariston, was contemporary with Apelles and Praxiteles, painted in encaustic and worked in marble and bronze, and produced, among other works commended by Plutarch and Pliny, *The Twelve Gods*, *The Battle of Mantinea*, and the *Feigned Insanity of Ulysses* in painting, and statues of *Paris*, *Valor*, and *Greece*.

EUPHRASY, n. *ū'frā-sĭ*, or EUPHRASIA [Gr. *euphrăsiă*,

delight]· the plant eye-bright, formerly supposed to be beneficial in diseases of the eyes; the *Euphrāsiă officĭnālis*, ord. *Scrophūlārĭācĕæ:* see EYE-BRIGHT.

EUPHRATES, *ū-frā'tēz* (in the oriental languages, *Frat*, *Phrat*, or *Forat*): largest river in w. Asia, forming with the Tigris, the most important river-system of that quarter of the world. It has its source in the heart of Armenia in two branches—the Kara Su and the Murad, of which the former rises 25 m. n.e. of the town of Erzerum, and flows s.w. to a point 10 m. n. of Keban' Ma'den, where it is met by the Murad, which rises on the s. slope of Alá Tagh, and flows w.s.w. to the point of confluence. From Keban' Ma'den, the E. flows in a general s. direction, with a tendency, however, to struggle westward toward the Mediterranean. In this part of its course, it breaks through the Taurus, and flows among the mountains for 45 m., emerging at Sumeisat, whence it continues navigable to the sea—a distance of 1,195 m.—and passing Bir, at which point it is 628 ft. above the level of the Mediterranean, and 100 m. distant from its nearest shore. After passing Samosta, it changes its direction, and flowing s., separates for a considerable distance Mesopotamia from Syria and the desert of Syrian Arabia. Curving s.e., it flows on, receiving scarcely any tributaries for about 700 m., until it is joined at Kurnah or Kornah by the waters of the Tigris. From Kurnah, the river, taking the name of the Shatt-el-Arab, continues in a s.e. direction, until, after being united by a canal with the Karun from the mountains of Persia, it empties by several arms, into the Persian gulf, 90 m. below Kurnah. The total length of the E. is 1,600 m.; area drained by all the waters which enter the Persian Gulf by the Shatt-el-Arab, 108,000 m. The average width of the Shatt-el-Arab is more than 600 ft.; it is navigable in midstream for vessels of 500 tons.—Various schemes have been proposed for an E. Valley railway, from the Mediterranean to the Persian Gulf, as an alternative route to India besides that of Suez.

The water of the E., though muddy, is not unwholesome. Its inundations, caused by the melting of the snows, are chiefly from the beginning of March, till the end of May; and in ancient times, when canals and embankments regulated these inundations, exercised the same beneficial effect on the country as those of the Nile on Egypt. See BABYLONIA.

EUPHROE, n. *ū'frō-ĕ* [etym. doubtful]: in *naut.*, long slat of wood, perforated for the passage of the awning-cords which suspend the ridge of an awning. The euphroe (or uphroe) and its pendent cords form a crow-foot.

EUPHROSYNE, *ū-frŏs'ĭ-nē* (i.e., the joyous one): one of the Graces (q.v.).

EUPHUISM, n. *ū'fū-ĭzm* [Gr. *euphŭēs*, growing or increasing well, graceful—from *eu*, well; *phŭē*, growth]: an expression affectedly refined; high-flown diction, with attempt at excessive elegance. EU'PHUIST, n. *-ĭst*, one who

uses such. EU'PHUIS'TIC, a. *-ĭs'tĭk*, pertaining to. *Note.*—EUPHUISM properly took its origin from an extravagant and affectedly witty book by John Lyly (q.v.), in the reign of Elizabeth, which he called *Euphŭēs.*

EUPHYLLITE, n. *ū-fĭl'līt* [Gr *euphullos*, well leaved; *eu*, well; *phullon*, a leaf]: transparent or translucent mineral, like mica, but splitting less easily; found in Delaware.

EUPION, *ū'pī-ŏn* [Gr. *eu*, well; *pīōn*, fat, well-fed]: extremely mobile oil, obtained from the lighter portions of the liquid products of the destructive distillation of wood (wood-tar), coal (coal-tar), and animal matter, and in the distillation of rape-seed oil. It may be obtained in a sufficient state of purity by acting upon the crude tars and oils by concentrated sulphuric acid, or a mixture of sulphuric acid and nitre, which removes the majority of the other ingredients; and on the distillation of the portion which resisted the action of the acid, the first part which passes over is the eupion. When pure, it has the composition C_6H_6, and is therefore a hydro-carbon. It is the lightest liquid known, having the density of 655 (water = 1,000), and is thin, colorless, and tasteless, with pleasant aromatic odor. It boils at 116° F., and distils readily; and is very inflammable, burning with a white flame of considerable luminosity and penetrating power. It makes a greasy stain on paper, is insoluble in water, very slightly soluble in alcohol, but readily miscible with ethers and oils in general.

EUPLASTIC, a. *ū-plăs'tĭk* [Gr. *euplastos*, that can be easily molded; *plassō*, I mold, I form]: in *phys.*, having the capacity of becoming organizable in a high degree, as in false membranes, resulting from acute inflammation in a healthy person.

EUPLECTELLA, n. *ū-plĕk-tĕl'la* [mod. L., dimin. of Gr. *euplektos*, well plaited, well twisted]: in *zool.*, Venus's Flower Basket, typical genus of *Euplectellidæ*, a family of siliceous sponges, section *Hexactinellidæ.*

EUPLEXOPTERA, n. *ū-plĕks-ŏp'tĕr-a* [Gr. *eu*, well; *plexis*, plaiting, weaving; *ptera*, wings: so called because the posterior wings, which are membraneous, are so elaborately folded, both longitudinally and transversely, as not to be adapted for flight]: in *entom.*, name given by Westwood to an order of insects containing but one family, the *Forficulidæ* or earwigs. Leach called them Dermaptera.

EUPLOTES, n. *ū-plō'tēz* [Gr. *euplōtos*, favorable to sailing; *eu*, well; *plōtos*, floating]: in *zool.*, typical genus of the family *Euplota*, a family of infusoria, founded by Ehrenberg. The body is surrounded by a carapace; there are two distinct alimentary orifices, neither of which is terminal. The locomotive organs consist of cilia, hooks, claws or styles. There are many species.

EUPODA, *ū'po-da* [Gr. well-footed]: family of coleopterous insects of the tetramerous section of the order; named from the great size of the hinder thighs of many of the species. They feed on the stems and leaves of plants.

some of them on aquatic plants, the roots of which afford food to their larvæ. The body is oblong; the antennæ filiform. Some of the Eupoda are among the most splendid of tropical insects.

EUPOLIS, *ū'po-lĭs:* abt. B.C. 446–410; b. Athens· comic poet. He was author of numerous plays, some of which obtained the honors of triumph, and others satirized current political events and the manners and conduct of noted contemporaries, not even Alcibiades being spared. He was a rival of Aristophanes, and was thought by many critics to surpass him in purity and grace of diction. Several studies of his life, time, and works have been published, but only slight fragments of his comedies have been preserved.

EUPSAMMIA, n. *ū-săm'mĭ-a* [Gr. *eu,* abundant; *psammos,* sand]: in *paleon.,* family of actinozoa, tribe *Perforata.* EUPSAM'MIDÆ, n. *-dē,* in *zool.,* family of *Zoantharia Sclerodermata,* tribe *Perforata;* range in time from the Upper Silurian till now.

EUPYRCHROITE, n. *ū-pīr-krō'īt* [Gr. *eu,* well; *pur,* fire; *chrōs,* skin, complexion]: in *mineral.,* variety of apatite.

EUPYRION, n. *ū-pĭr'ĭ-ŏn* [Gr. *eu,* well, good; *pur,* fire]: contrivance for obtaining a light instantaneously, as a lucifer match, etc.

EURASIAN, *ū-rā'zĭ-ăn* [contr. from *Europe* and *Asia*]: a cross breed between a European and an Asiatic; denoting in India, chiefly the children by European fathers of Hindu mothers, and their descendants: ADJ. pertaining to both continents. EURA'SIA, n. *-zĭ ă,* sometimes used as a name for Europe and Asia conjoined.

EURE, *ŭr:* river of the n.w. of France, tributary of the Seine. It rises in the dept. of Orne, flows first s.e. into the centre of the dept. of Eure-et-Loir, then n. and n.w. through the depts. of Eure-et-Loir and Eure, and joins the Seine on the left above Pont de l'Arche, after a course of about 100 m. Only the portion in the dept. of Eure is navigable.

EURE: department in the n.w. of France, immediately s. of the dept. of Seine Inférieure; 2,290 sq. m. Its surface is unusually level, as the highest eminences are not more than 300 ft. in height. The principal river is the Seine. The Eure, from which this dept. is named, and Rille, both affluents to the Seine, are the other important rivers. The climate is mild, moist, and foggy. Great part of the level country is covered with a loamy, alluvial soil upon a stratum of limestone; the remainder is of chalk, flint, and tufa. Along the Seine, the soil is in some parts sandy, stony, and barren, but the greater part is very fertile. The chief natural products are grain, hemp, flax, vegetables, and fruit, particularly apples and pears from which large quantities of cider and perry are made. The breeding of cattle, horses, and sheep, is favored by extensive meadows and pasture-lands. Iron is found in considerable quantities. There are extensive iron and copper works and pin

manufactories. Cotton goods, cloth, linen, paper, glass, and stoneware are manufactured. The dept. is divided into five arrondissements—Evreux, Louviers, Les Andelys, Bernay, and Pont-Audemer. The cap. is Evreux (q.v.). Pop. of dept. (1901) 334,781.

EURE-ET-LOIR, *ŭr-ā-lwâr:* department of France formed chiefly from the province of Orléannais: between lat. 47° 57′—48° 55′ n., and long. 0° 47′—2° e.; 2,260 sq. m. It is watered mainly by the Eure in the n. and the Loir in the s. This dept. lies on the water-shed between the Bay of Biscay and the English Channel. The soil is fertile and especially toward the e. and s. is admirably adapted for wheat. Hops grow spontaneously in some quarters. Iron is the only mineral found and worked to any great extent; but the chief articles of trade are grain, flour, and wool. The dept. is divided into the four arrondissements of Chartres, Château-Dun, Dreux, and Nogent-le-Rotrou, with the town of Chartres for capital. Pop. of dept. (1901) 275,433.

EUREKA, n. *ū-rē′kă* [Gr. *eurēkă*, I have found]: discovery made after long and difficult research—so called in allusion to the story of Archimedes, famous philosopher of Syracuse, who is said to have repeatedly uttered this word upon suddenly discovering a method of estimating the adulteration which King Hiero suspected that the goldsmith had made in his golden crown. The philosopher, whom the king had commissioned to test the crown, was stepping into his bath, and noticed that the water overflowed, being displaced in proportion to the bulk of the immersed object. Considering that gold is smaller than silver at equal weight, he inferred that the immersion of the crown would be a test of its alloy.

EUREKA, Cal., city, county-seat of Humboldt co.; on Humboldt Bay, the Eel River, and the San Francisco & N. W., the California N., the Eureka & K. R. R.R.'s; 225 miles northwest of San Francisco. It has a fine harbor, which has been improved by the United States government on the jetty plan. The city is situated in the famous redwood region, and has large lumber interests. Sequoia Park, a tract of 40 acres of redwood forest, is near the city. The city has gas and electric lights, high schools, daily and weekly newspapers, and five banks. Pop. (1910) 11,845.

EUREKA, *ū-rē′ka:* town, cap. of Eureka co., Nev.: on the Eureka and Palisade railroad, connecting with the Central Pacific railroad 90 m. n. It is 35 m. w.n.w. of Hamilton, 65 m. e. of Austin, about midway between Salt Lake City and San Francisco. It has 20 mining districts more or less tributary to its prosperity; is within three m. of the famous Ruby Hill and Prospect Mountain mines, and has several lead and silver smelting works. Pop. (1910 est.) 2,100.

EURHODINES: the chemical name of an important class of dyes, generally of a red color. They are prepared by the action of an ortho aminoazo derivative on an aro-

matic amine and may be regarded as more or less complicated substitution products of phenazine, $C_6H_4<\begin{matrix}N\\|\\N\end{matrix}>C_6H_4$. Sometimes the term 'toluylene red' is applied to this group of dyes, from the name of the first techincally valuable number of the series which was discovered.

EURIPIDES, *ū-rĭp'ĭ-dēz:* latest of the three great Greek tragedians: probably B.C. 480, Sep. 23—406; b. Salamis, on the very day, it is said, of the glorious victory of the Greeks over the Persians near that island. (The Arundel Marble, however, gives as the date of his birth B.C. 485, while Müller, following Eratosthenes, makes it B.C. 489). His education was very good. At first, he was trained to gymnastic exercises (in consequence of the prediction of an oracle that he should be crowned with 'sacred garlands'); he turned his attention next to painting; then studied philosophy under Anaxagoras, and rhetoric under Prodicus, and formed a lasting friendship with Socrates. Euripides's first play performed was the *Peliades* (B.C. 456). In B.C. 441, he gained the first prize for tragedy, and continued to write for the Athenian stage until B.C. 408, when he accepted an invitation to the court of Archelaus, King of Macedonia. Scandal has invented reasons unworthy of notice for Euripides's leaving Athens. He is said to have been killed by dogs, set upon him by two brother poets who envied his reputation. In Euripides's time Greek tragedy had been brought to its highest point by Sophocles, who was 15 years older. Euripides, however, was the second favorite author of his time; nay, on more than one occasion, his tragedies were preferred to those of Sophocles; but his liberal and even neologistic tendencies in regard to religion excited the hostility of that witty but scurrilous champion of Greek orthodox paganism, Aristophanes, who frequently ridiculed Euripides in cutting parodies. There can be no doubt that Euripides was systematically abused by the Athenian tory party, of whom Aristophanes was literary chief, and to whose unscrupulous opposition it was owing that he gained the prize only five times out of 75 competitions. But against the censure of Aristophanes, may be set the praise of two much greater men—Aristotle and John Milton. Euripides's plays are reckoned by some to have amounted to 75, by others to 92. Only 18 have come down to us. These are—*Alcestis* (B.C. 438), *Medea* (B.C. 431), *Hippolytus* (B.C. 428), *Hecuba* (B.C. 424), *Heracleidæ* (B.C. 421), *Supplices* (B.C. 421), *Ion* (date not ascertainable), *Hercules Furens* (date not ascertainable), *Andromache* (B.C. 420–417), *Troades* (B.C. 415), *Electra* (B.C. 415–413), *Helena* (B.C. 412), *Iphigeneia in Tauris* (date uncertain), *Orestes* (B.C. 408), *Phœnissæ* (probably same year), *Bacchæ* (written probably in Macedonia), *Iphigeneia in Aulis* (posthumously represented in Athens), and *Cyclops* (uncertain). *Rhesus*, attributed to Euripides, is probably not genuine. Concerning Euripides and his tragedies, A. W. Schlegel remarks: 'Of few authors can so much good and evil be predicated with equal truth. He

was a man of infinite talent, skilled in the most varied intellectual arts; but though abounding in brilliant and amiable qualities, he wanted the sublime earnestness and artistic skill which we admire in Æschylus and Sophocels. He aspires only to please, no matter by what means. For this reason, he is so frequently unequal to himself; producing at times passages of exquisite beauty, and frequently sinking into positive vulgarity.' The main object of Euripides was to excite emotion, and his works laid open a totally new world (in literature), that of the heart, which beyond dispute, contributed much to their popularity. On the other hand, his inartistic and careless plots compelling him to a constant use of the *Deus ex machinâ* solution of difficulties, and occasionally even the subjects of his art themselves, leave ample room for criticism. Archelaus refused to allow his bones to be removed to Athens, and erected a splendid monument to him in Pella, with the inscription: 'Never, O Euripides, will thy memory be forgotten!' Still more honorable was the inscription on the cenotaph erected to him by the Athenians on the way to the Piræus: 'All Greece is the monument of Euripides; Macedonian earth covers but his bones.' Sophocles, who survived him, publicly lamented his loss; and the orator Lycurgus afterward erected a statue to him in the theatre at Athens. The *editio princeps of Euripides* appeared, it is thought, at Florence, toward the end of the 15th c. The best modern editions are: Beck (Leip. 1778–88), Matthiae (Leip. 1813–29), Kirchhoff (1855), and Nauck (1871). An English translation in verse by Potter, appeared, Oxford, 1814.

EURIPUS: see CHALCIS: EUBŒA.

EURITE, n. *ū'rīt* [F. *eurite:* Gr. *eurŭtŏs,* well or wide flowing]: a fine-grained white variety of felspathic granite; whitestone. EURIT'IC, a. *-ĭk,* pertaining to. EURITIC-PORPHYRY, in *petrology,* a porphyry of which eurite is the basis, or which consists mainly of eurite.

EUROCLYDON, n. *ū-rŏk'lĭ-dŏn* [Gr. *euros,* a s.e. wind; *klŭdōn,* a wave]: tempestuous wind which prevails in the Mediterranean. In the account of the apostle Paul's shipwreck, Acts xxvii. 14, the name Euroclydon is now thought to be properly *Euraquilo:* the meaning is in some doubt; but probably the bitterly cold tempestuous wind, now called *Bora,* which sweeps over the Adriatic, similar to a *north-easter.*

EUROPA, *ū-rō'pa:* in mythology, daughter of Agenor, King of Phœnicia, and Telephassa, and sister of Cadmus. Her extreme beauty enamored Jupiter, who, to engage her affections, assumed the shape of a bull and mingled with the herds of Agenor. Europa caressed the animal, and in time had courage to mount his back, when he ran away with her, crossed the sea, and arriving in Crete, assumed his original shape and declared his love. Though under vows of perpetual celibacy, Europa consented, and became mother of Minos, Sarpedon, and Rhadamanthus. Subsequently she married Asterius, King of Crete.

EUROPE.

EUROPE, *ū′rŭp:* smallest and most highly civilized of the three great divisions of the old continent. It is separated from America on the w. and n.w. by the Atlantic; and from Africa on the s. by the Mediterranean; and from Asia by the Archipelago, Sea of Marmora, Black Sea, Caucasian ridge, Caspian Sea, Ural river and mountains, and the Kara river. It is in the form of a huge peninsula, projecting from the n.w. of Asia. Its extent from Cape St. Vincent on the s.w. to the mouth of the Kara river on the n.e. is 3,400 m.; and from Cape Nordkun, the most northerly point of the Scandinavian mainland, to Cape Matapan, the southmost point of Greece, 2,400 m. The continent of E., irrespective of islands, lies within lat. 36° 1′—71° 6′ n., and long. 9° 30′ w.—68° 30′ e.; area, estimated 3,367,000 sq. m., about a third of that of Africa, and a fourth of that of America. Pop. abt. 365,000,000; average, 108 to a sq. m. Its indented coast-line is more extensive in proportion to its size than any other great natural division of the globe, and is estimated not less than 50,000 m. This is caused by its great irregularity, and the number of deep inlets and gulfs which penetrate its surface.

The body of the European continent divides itself naturally into two great portions—the great plain in the n.e., and the Highlands in the s.w.—the mountainous peninsula of Scandinavia lying apart from either, being in some sense exceptional. The plain occupies about two-thirds (2,500,000 sq. m.) of the entire extent of the continent. It reaches from the e. boundary of E., n. to the Arctic Ocean, s. to Mount Caucasus and the Black Sea, and w. over the whole extent of the continent; gradually, however, becoming narrower in its progress west. In shape, this plain resembles a triangle; its base rests on the e. boundary, and it may be said to reach its apex on the shores of Holland. It separates the two mountain systems of E.—the Scandinavian system (see SCANDINAVIA) on the n., and on the s. the system of s. Europe. The mass of the Alps, covering nearly 100,000 sq. m., forms the centre of the mountain system of s. and w. E., and stretches down on four sides toward France, Germany, Hungary, and Italy. The lowland plain, next Asia, lying e., is low, interspersed with woods and marshes, and cultivated land. See ALPS: APENNINES: BALKAN: CARPATHIAN MOUNTAINS: CEVENNES: PYRENEES: etc.

E. is surrounded by water on three sides. The White Sea comes in from the Arctic Ocean; the German Ocean and the Mediterranean from the Atlantic. The most important peninsula in the n. is Scandinavia, and in the s. are the Crimea, Turkey and Greece, Italy, and Spain. With the exception of Iceland, the islands cluster closely round the mainland, the chief being Great Britain and Ireland, Iceland, Seeland, Corsica, Sardinia, and Crete (Candia). The lakes of E. are small as compared with those of Africa or America. The Volga and the Danube are the largest rivers.

For details of the geography of E., see the titles of its

several political divisions, and of its lakes, rivers, and mountains.

In respect of climate, far the greater portion of E. belongs to the n. section of the temperate zone, though parts of Norway, Sweden, and Russia lie within the Arctic Circle. The s. parts of Spain, Sicily, and Greece are abt. 12 degrees from the n. tropic. (See RAINFALL: TERRESTRIAL TEMPERATURE).

The European races belong in the main to the various branches of the great Aryan stock (see ARYANS: ETHNOLOGY), though in few European countries is there a pure race—the admixture of races being in some cases very great and close. But generally speaking, Celtic blood is found most largely in France (especially in Brittany where a Celtic tongue is still spoken), and a part of Great Britain and Ireland; Germanic people occupy Germany, Switzerland, Netherlands, part of Belgium, part of Austria, Denmark, Norway and Sweden, Iceland, and Great Britain. Slavonic races are found in Austria, Prussia, Turkey, and Russia (see SLAVONIANS). Romanic blood and language are prominent in Italy, France, Spain, and Portugal, and perhaps Roumania—but language is not always a true test of race. The Greeks belong to the same Greco-Italian branch as the Italians. Non-Aryan peoples are the Finns, Lapps, and Samoieds of the n. and n.e.; various Turanian tribes in the e. of Russia; the Hungarians and the Turks, and the Basques of the Pyrenees, also are non-Aryan.

The table on the next page gives a comparative view of the states of Europe, their areas, and populations. In almost all except Russia and Turkey, the populations are given according to actual censuses 1878-81. For details as to the states composing the German empire, see GERMANY; for the constituent parts of the Austro-Hungarian monarchy, and of the joint kingdoms of Sweden and Norway, see the several titles. For the relation of Turkey to Bulgaria, Eastern Roumelia, Bosnia, and Herzegovina (the latter three being here included within its boundaries), see those titles.

Geology.—For the geology of E., see the different countries: also ALPS: PYRENEES: ETC.

Natural History.—The natural history of E. very much agrees with that of the corresponding latitudes of Asia. The natural history of the European countries on the Mediterranean Sea is very similar to that of Syria and of Asia Minor. The natural history of the more northern regions of E. resembles that of the great plains of Central Asia and Siberia. The most northern regions have the strictly arctic flora and fauna common in a great measure to all the arctic and subarctic regions; while the natural history of the most southern countries assumes a sub-tropical character. The European countries near the Mediterranean produce fewer of the shrubby and odoriferous *Labiatæ* than the Caucasus and adjoining regions, while the *Caryophyllaceæ* are more abundant. The extreme abundance of *Cistaceæ* is

EUROPE
SCALE OF MILES
0 100 200 300 400 500
ARCTIC OCEAN
ATLANTIC OCEAN
MEDITERRANEAN SEA
BALTIC SEA
BLACK SEA
CASPIAN SEA
ARAL SEA
Strait of Denmark
Arctic Circle
Reykjavik
ICELAND
FAROE IS.
SHETLAND IS.
ORKNEY IS.
HEBRIDES
BRITISH ISLES
IRELAND
SCOTLAND
Edinburgh
Liverpool
Dublin
Belfast
Londonderry
Glasgow
Galway
Limerick
Cork
Birmingham
Manchester
Leeds
Hull
Newcastle
Aberdeen
WALES
Queenstown
Brisaol
Plymouth
Southampton
English Channel
NORWAY
Hammerfest
North C.
Vardo
Tromso
LOFOTEN IS.
Trondhjem
Bergen
Piten
Umea
Hernosand
Gefle
Upsala
Tornea
Gulf of Bothnia
Finland
Lapland
Kola Penin.
Mezen R.
Archangel
White Sea
Dwina R.
Petchora R.
Kara R.
NOVA ZEMLA
VAIGACH I.
Obdorsk
Surgut
Obi R.
Tomsk
Tobolsk
Irtish R.
Omsk
Tiumen
Ishim R.
Tobol R.
Ekaterinburg
Tcheljabinsk
Zlatoust
Perm
Vologda
Yaroslaf
Viatka
Nishni Novgorod
Sarapul
Kama R.
Ufa
Samara R.
Orenburg
Orskaia
Uralsk
Ural R.
Gurief
Kamishin
Volga R.
Astrakhan
Ust Urt Plateau
Aralsk
Krasnovodsk
Caucasus Mts.
Derbend
Baku
Tillis
Batum
Petrovsk
Vladikavkas
Elbruz
Kertch
Taganrog
Rostof
Don R.
Veronesh
Kharkof
Kief
Kursk
Orel
Briansk
Mohilef
Tula
Moscow
Smolensk
Vladimir
Kazan
Morshansk
Penza
Koslof
Saratof
Volga R.
Oka R.
Kama R.
Samara
Ufa
Riga
Windau
Libau
Kovno
Vilna
Minsk
Pinsk
Brest Litowsk
Dantzig
Konigsberg
Rostock
Bremen
Hamburg
Amsterdam
Antwerp
Ghent
Brussels
Cologne
Leipzig
Dresden
Berlin
Posen
Lodz
Breslau
Warsaw
Lublin
Lutsk
Berditchef
Dniester R.
Ekaterinoslaf
Nikolaief
Cherson
Berdiansk
Sea of Azof
Odessa
Sevastopol
Kishinef
Jassy
Lemberg
Karpathian Mts.
Prague
Brunn
Vienna
Budapest
Munich
Stuttgart
Frankfort
Danube R.
Elbe R.
Rhine R.
Strasburg
Metz
Nancy
Luxemburg
Rheims
Rouen
Havre
Cherbourg
Brest
Paris
Seine R.
Loire R.
Tours
Nantes
Orleans
Dijon
Basel
Zurich
Innsbruck
Bern
Geneva
Lyons
Turin
Milan
Venice
Triest
Agram
Fiume
Kronstadt
Hermannstadt
Klausenburg
Debreczin
Pesth
HUNGARY
AUSTRIA
SWITZERLAND
FRANCE
Bay of Biscay
C. Ortegal
C. Finisterre
Bordeaux
Toulouse
Bayonne
Biarritz
Pau
Narbonne
Montpellier
Arles
Nice
Cannes
Marseilles
Toulon
Genoa
Florence
Leghorn
Ancona
Rimini
Ravenna
Bologna
Parma
Modena
Corsica
Ajaccio
Bastia
Sardinia
Cagliari
Sassari
Balearic Is.
Barcelona
Valencia
Murcia
Cartagena
Malaga
Cordova
Seville
Cadiz
Gibraltar
Tangier
Ceuta
Oran
Algiers
Tunis
Fez
AFRICA
Str. of Gibraltar
C. St Vincent
Tagus R.
Lisbon
Oporto
Vigo
Corunna
Valladolid
Sargossa
Madrid
Portugal
Spain
Andorra
Rome
Naples
Tyrrhenian Sea
Messina
Palermo
Catania
Syracuse
Sicily
Ionian Sea
C. Bon
Malta
Brindisi
Taranto
Gulf of Taranto
Adriatic Sea
Spalato
Cattaro
Montenegro
Servia
Belgrade
Bosnia
Herzegovina
Bulgaria
Roumelia
Sofia
Rustchuck
Varna
Bukharest
Constantinople
Adrianople
Gallipoli
Sea of Marmora
Dardanelles
Turkey
Saloniki
Gulf of Salonika
Larissa
Thessaly
Greece
Patras
Corinth
Athens
Crete or Candia
Rhodes
Cyprus
Aegean Sea
Smyrna
Asia Minor
Sinope
Trebizond
Brussa
Anan
Bagdad
Beirut
Persia
Teheran
Ispahan
Kustendje
Sea of Azof
Kertch
Taganrog
Rostof
Don R.
Volga R.
Astrakhan
Caspian Sea
Ust Urt Plateau
Aralsk
Orenburg
Orskaia
Uralsk
Ural R.
Gurief
Kamishin
Volga R.
Saratof
Koslof
Penza
Morshansk
Oka R.
Kama R.
Samara
Ufa
Vladimir
Kazan
Nishni Novgorod
Sarapul
Yaroslaf
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Vologda
Perm
Ekaterinburg
Tcheljabinsk
Zlatoust
Tobolsk
Irtish R.
Omsk
Tiumen
Ishim R.
Tobol R.
Obi R.
Surgut
Obdorsk
Tomsk
Petchora R.
Kara R.
Mezen R.
Archangel
Dwina R.
Vytchegda R.
Kotlas
Veliki Ustyug
Suchona R.
Onega
Onega R.
L. Onega
Ladoga
L. Ladoga
Vytegra
Abo
Helsingfors
Gulf of Bothnia
Sweden
Stockholm
Gothland
Gothenburg
Skagerack
Christiansand
Christiania
Norway
Fredrickshald
Upsala
Gefle
Hernosand
Umea
Piten
Tornea
Lofoten Is.
Tromso
Hammerfest
North C.
Vardo
Varanger Fjord
Kanin Noss
Kolguef I.
Mezen R.
Petchora R.
Kara R.
Nova Zemla
Vaigach I.
Obdorsk
Surgut
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Ural R.
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Kamishin
Volga R.
Astrakhan
Ust Urt Plateau
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Krasnovodsk
Caucasus Mts.
Derbend
Baku
Tillis
Batum
Petrovsk
Vladikavkas
Elbruz
Kertch
Taganrog
Rostof
Don R.
Veronesh
Kharkof
Kief
Kursk
Orel
Briansk
Mohilef
Tula
Moscow
Smolensk
Vladimir
Kazan
Morshansk
Penza
Koslof
Saratof
Volga R.
Oka R.
Kama R.
Samara
Ufa
Riga
Windau
Libau
Kovno
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Brest Litowsk
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Rostock
Bremen
Hamburg
Amsterdam
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Cologne
Leipzig
Dresden
Berlin
Posen
Lodz
Breslau
Warsaw
Lublin
Lutsk
Berditchef
Dniester R.
Ekaterinoslaf
Nikolaief
Cherson
Berdiansk
Sea of Azof
Odessa
Sevastopol
Kishinef
Jassy
Lemberg
Karpathian Mts.
Prague
Brunn
Vienna
Budapest
Munich
Stuttgart
Frankfort
Danube R.
Elbe R.
Rhine R.
Strasburg
Metz
Nancy
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Rheims
Rouen
Havre
Cherbourg
Brest
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Seine R.
Loire R.
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Orleans
Dijon
Basel
Zurich
Innsbruck
Bern
Geneva
Lyons
Turin
Milan
Venice
Triest
Agram
Fiume
Kronstadt
Hermannstadt
Klausenburg
Debreczin
Pesth
Hungary
Austria
Switzerland
France
Bay of Biscay
C. Ortegal
C. Finisterre
Bordeaux
Toulouse
Bayonne
Biarritz
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Cannes
Marseilles
Toulon
Genoa
Florence
Leghorn
Ancona
Rimini
Ravenna
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Parma
Modena
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Ajaccio
Bastia
Sardinia
Cagliari
Sassari
Balearic Is.
Barcelona
Valencia
Murcia
Cartagena
Malaga
Cordova
Seville
Cadiz
Gibraltar
Tangier
Ceuta
Oran
Algiers
Tunis
Fez
Africa
Str. of Gibraltar
C. St Vincent
Tagus R.
Lisbon
Oporto
Vigo
Corunna
Valladolid
Sargossa
Madrid
Portugal
Spain
Andorra
Rome
Naples
Tyrrhenian Sea
Messina
Palermo
Catania
Syracuse
Sicily
Ionian Sea
C. Bon
Malta
Brindisi
Taranto
Gulf of Taranto
Adriatic Sea
Spalato
Cattaro
Montenegro
Servia
Belgrade
Bosnia
Herzegovina
Bulgaria
Roumelia
Sofia
Rustchuck
Varna
Bukharest
Constantinople
Adrianople
Gallipoli
Sea of Marmora
Dardanelles
Turkey
Saloniki
Gulf of Salonika
Larissa
Thessaly
Greece
Patras
Corinth
Athens
Crete or Candia
Rhodes
Cyprus
Aegean Sea
Smyrna
Asia Minor
Sinope
Trebizond
Brussa
Anan
Bagdad
Beirut
Persia
Teheran
Ispahan
Kustendje
Sea of Azof
Kertch
Taganrog
Rostof
Don R.
Volga R.
Astrakhan
Caspian Sea
Ust Urt Plateau
Aralsk
Orenburg
Orskaia
Uralsk
Ural R.
Gurief
Kamishin
Volga R.
Saratof
Koslof
Penza
Morshansk
Oka R.
Kama R.
Samara
Ufa
Vladimir
Kazan
Nishni Novgorod
Sarapul
Yaroslaf
Viatka
Vologda
Perm
Ekaterinburg
Tcheljabinsk
Zlatoust
Tobolsk
Irtish R.
Omsk
Tiumen
Ishim R.
Tobol R.
Obi R.
Surgut
Obdorsk
Tomsk

States.	Form of Government.	Extent in English sq. miles.	Population.	Number of inhabitants per English sq. mile.	Census Year.
Andorra	Republic, with a sovereign council	175	6,000	34	(1901)
Austria-Hungary	Limited monarchy, 2 chambers for each country	241,333	45,405,267	188	(1900)
Belgium	Limited monarchy, two chambers	11,373	6,693,548	589	(1900)
Bosnia, Herzegovina, etc.	Provinces occupied by Austria-Hungary	23,262	1,568,092	67	(1895)
Bulgaria and E. Roumelia	Principality under Turkey	37,860	3,309,816	85	(1893)
Denmark	Limited monarchy, two chambers	15,360	2,464,770	160	(1901)
France	Republic, two chambers	207,054	38,961,945	188	(1901)
Germany	Limited monarchy, two chambers	208,830	56,367,178	270	(1900)
Great Britain and Ireland	Limited monarchy, two chambers	120,979	41,607,552	343	(1901)
Greece	Limited monarchy, one chamber	25,014	2,433,806	97	(1896)
Italy	Limited monarchy, two chambers	110,550	32,475,253	293	(1901)
Luxemburg	Grand-duchy, Netherlands	998	236,543	247	(1900)
Monaco	Principality, one chamber	8	15,180	1,896	(1900)
Montenegro	Limited monarchy (dependent), one chamber	3,630	228,000	62	(1900)*
Netherlands	Limited monarchy, two chambers	12,648	5,263,232	416	(1901)
Portugal	Limited monarchy, two chambers	36,038	5,428,659	150	(1900)
Roumania	Limited monarchy, two chambers	50,720	5,912,520	116	(1899)
Russia (Europe)	Absolute monarchy	2,095,616	106,264,136	51	(1897)
San Marino	Republic, sovereign council	38	11,002	289	(1899)
Servia	Limited monarchy, two chambers	18,630	2,493,770	134	(1900)
Spain	Limited monarchy, two chambers	194,783	18,618,086	96	(1900)
Sweden and Norway:					
Sweden	Limited monarchy, two chambers for each country	172,876	5,175,228	29	(1900)
Norway		124,129	2,239,880	18	(1900)
Switzerland	Republic, confederation, federal diet	15,976	3,315,443	207	(1900)
Turkey (Europe)	Absolute sovereignty	65,752	6,086,300	92	(1900)*

* Estimated.

a peculiar feature of the flora of Spain and Portugal. The *Primulaceæ* are particularly plentiful in all the alpine regions of the s. of E., but this characteristic is in some measure shared by the Himalaya. In no other part of the world do umbelliferous and cruciferous plants form so large a proportion of the flora as in Europe.

The temperature of the w. and n. parts of E. being raised by the Gulf-stream and the winds from the great mass of dry and desert land in Africa above what is elsewhere found in similar latitudes, the flora and fauna exhibit a corresponding character, affected, however, by the great amount of moisture from the Atlantic Ocean; also to a still greater degree by the comparative uniformity of temperature which the proximity of the ocean produces. The effect of the last-mentioned causes is so great, that the northern limit of some plants is sooner reached on the shores of the Atlantic than in the more central parts of E., where the winters are much colder, and the average temperature of the year is lower. Of this the vine and maize are notable examples. Plants which require a mild winter will not grow in the n.—scarcely even in the centre of E.—but they advance along the w. coast under the influence of the maritime climate. Thus the myrtle—though not indigenous—grows even in the s. of England. Among plants, the date palm, and among animals a species of ape, are found in the s. of E. (the ape only on the Rock of Gibraltar); while some strictly African birds are frequent visitants, and many birds—as the cuckoo, swallow, etc.—are common to E. and Africa, inhabitants in summer even of far northern regions, and returning in winter to the warm south.

Of the plants now most commonly associated in our thoughts with the s. countries of E., may have probably been introduced from Africa, or the East. This seems to have been the case even with the myrtle, and certainly has been with the vine, the olive, the orange, lemon, etc., the the fig, the peach, the almond, the apricot, etc. Some of the most extensively cultivated fruits are certainly indigenous to E., as the apple, pear, plum, and cherry, although even of these the first improved varieties may have been introduced from the earlier seats of civilization in the East. Among the wild animals of E. at the present day, the aurochs (bison) is still reckoned; and the ox existed wild at no very remote period. The reindeer inhabits the extreme n. of E.; the elk, the stag, the fallow-deer, and the roebuck, are found in more southern regions; the ibex or bouquetin exists on the high central mountains; two species of antelope—the chamois of the Alps, and the saiga of the Russian plains—connect the European fauna with the Asiatic and African. Of carnivorous animals, the most noticeable are the bear, the wolf, the fox, and lynx.

The abundance of lakes and streams in the n. parts of E. is accompanied with a corresponding abundance of waterfowl (*Anatidæ*) and of fish. Of the latter, the *Salmonidæ* are most valuable, and the *Cyprinidæ* next. The European seas afford valuable fisheries, particularly of herring and of

SOUTHEASTERN
EUROPE
SCALE OF MILES
0 25 50 100 150 200
Longitude East from Greenwich
FRANCE
SWITZERLAND
AUSTRIA
HUNGARY
RUSSIA
RUMANIA
SERVIA
BULGARIA
EASTERN ROUMELIA
MONTENEGRO
TURKEY
GREECE
ITALY
AFRICA
ASIA
BLACK SEA
ADRIATIC SEA
TYRRHENIAN SEA
IONIAN SEA
ÆGEAN SEA
LIGURIAN SEA
MEDITERRANEAN SEA
SEA OF CANDIA
Sea of Marmora
Gulf of Genoa
Gulf of Taranto
CORSICA
(To France)
SARDINIA
SICILY
CRETE
MALTA
Budapest
BELGRADE
BUKHAREST
SOFIA
Cetinje
CONSTANTINOPLE
ATHENS
ROME
Naples
Florence
Venice
Trieste
Milan
Turin
Genoa
BERN
Marseilles
Odessa
Adrianople
Smyrna
Balkan Mts.
Danube R.

cod in the n., and of tunny, anchovy, etc., in the Mediterranean.

The common hive bee and the Ligurian bee may be regarded as probably natives of Europe. The silk-worm was introduced from the East. Another valuable insect, the cochineal insect, was introduced from America; but, the *Cantharis*, or blistering fly, is truly indigenous to the s. of Europe.

EUROPEAN, n. *ū′rō-pē′ăn* [Gr. *eurus*, broad, and the root *op*, to see: comp. Gael. *Eu-ropach*, unravelled, unknown]: a native of Europe: ADJ. pertaining to. EUROPEANIZE, v. to naturalize in Europe; to adapt or accommodate to European manners, character, or usages.

EUROPIUM: the name of an element discovered by Demarcay. It belongs to the class of the 'rare earths' (q.v.) and its claim to recognition as an individual element is not yet free from doubt.

EURYALE, n. *ūr-ī′a-lē* [L. *Euryale*, one of the Gorgons, from the thorny, menacing habit of the plant]: in *zool.*, genus of *Ophiuroidea;* typical of the family *Euryalidæ*. The arms are bifurcate. EURYALIDÆ, n. *ūr-ī-ăl′ĭ-dē* [mod. L. *curyale*]: in *zool.*, Gorgon's head; family of *Ophiuroidea*. They have ten genital fissures, and branched arms and cirri like the dishevelled hair of the Gorgon; found in tropical seas.

EURYALE, *ū-rī′a-lē:* genus of plants of the nat. ord. *Nymphœaceœ*, or Water-lilies, closely allied to VICTORIA (q.v.), though of very different appearance. *Euryale ferox* is a water-lily with small red or violet-colored flowers, leaves about 12 inches in diameter, the leaf-stalks and calyces covered with stiff prickles; native of India and China. The fruit is round, soft, pulpy, and of the size of a small orange, composed of a number of carpels, and containing round, black seeds as large as peas which are full of a nutricious, agreeable farina, and are eaten roasted. The root-stock contains starch which may be separated and used for food; and the root itself is eaten. The plant is said to have been in cultivation in China for more than 3,000 years.

EURYDICE, n. *ū-rĭd′ĭ-sē* [Gr.]: in *Gr. myth.*, the wife of Orpheus (q.v.); also the wife of Amyntas, King of Macedonia, and mother of Philip, the father of Alexander the Great.

EURYLAIMINÆ, n. *ūr-ĭ-lā-mī′nē* [Gr. *eurus*, broad, large; *laimos*, throat]: broad-bills; sub-family of *Coracidæ* (rollers). They have short, very broad bills, rather short wings, and strong feet, the outer toe connected for half its length to the middle one, the hinder toe long, the inner one the shortest of any. They inhabit the E Indies and adjacent islands, suspending their nests, composed of small twigs, from the branches of trees overhanging water; type, *Eurylaimus*.

EURYNOME, n. *ū-rĭn′o-mē* [Gr.]: in *Gr. myth.*, one of

the Oceanides, who, together with Ophion, ruled over the world before Saturn and Rhea took possession of it.

EURYNOTUS, n. *ū′rĭ-nō′tŭs* [Gr. *eurus*, broad, ample; *notos*, the back]: in *geol.*, a genus of lepidoid fishes occuring in the carboniferous formation, having a high bream-like back. EURYPTERUS, n. *ū-rĭp′tėr-ŭs*, or EU′RYPTER′IDÆ, n. plu. *-tĕr′ĭ-dē* [Gr. *ptĕrŏn*, a wing or fin]: in *geol.*, a genus and family of extinct crustaceans, allied to the king-crab, so termed in allusion to their broad, oar-like swimming feet. EURYP′TERITE, n. *-tėr-īt*, any one of the eurypterus family, or any undetermined portion or specimen.

EURYTHMY, n. *ū′rĭth-mĭ* [Gr. *eurŭth′mĭă*, complete harmony—from *eu*, well; *ruthmos*, rhyme, measure]. in *arch.*, the exact proportion between all parts of a building.

EUSEBIAN, a. *ū-sē′bĭ-an* [named after two bishops, *Eusebius* Pamphili, bp. of Cæsarea, often called the Father of Church History, and the bp. of Nicomedia, afterward of Constantinople. Both were intimate with Constantine the Great]: relating to either of the two Eusebiuses. EUSEBIANS, a semi-Arian sect, followers of the two Eusebiuses. They held that there was a subordination among the persons of the Godhead, and are hence by some technically called Subordinationists. They opposed Athanasius and supported Arius at the Council of Tyre, 335, and subsequently.

EUSEBIUS, *ū-sē′bĭ-ŭs*, of Cæsarea, or EUSEBIUS PAMPHILI: father of ecclesiastical history: abt. 264—abt. 340; b. in Palestine. He took the surname of Pamphili from his friend Pamphilus, bishop of Cæsarea, whom he faithfully attended for the two years (307–309) of his imprisonment during the persecution of Diocletian. He then went to Tyre, and afterward to Egypt, where he himself was thrown into prison on account of his religion. In 315, he succeeded Agapius as bishop of Cæsarea, and was prominent at the Council of Nice 327. Eusebius was the head of the so-called semi-Arian, rather the moderate party in the Council of Nice. That party were averse to discussing the philosophy of the Trinity, and would have preferred the simplicity of Scripture language in speaking about the Godhead to the metaphysical distinctions of either side. They regarded Trinitarianism, on the one hand, as logically indefensible, but, on the other, they recognized the fact, that Scripture in many passages speaks of the Son in terms not compatible with the views of Arius; therefore they wished each man to have the utmost freedom in his interpretation of Scripture on this point. Eusebius thought that the great thing was to lay to heart the truth, that 'God so loved the world that he gave his only begotten Son, that whosoever believeth on him should not perish, but have everlasting life.' The promise is to him that *believeth on* the *Son of God*, not, he argues, to him that *knows how the Son is generated from the Father*. He was very reluctant to accept the term *homoousios* (of the same substance), devised by Athanasius to describe the

equality of the Son with the Father, and retained the kindliest feelings toward Arius after the views of the latter were condemned. His moderation and other excellent qualities procured him the favor of Constantine, who declared he was fit to be the bishop of almost the whole world. Eusebius has the reputation of being after Origen the most learned Father of the church. His chief works are—(1) The *Chronicon*, a history of the world down to the celebration of Constantine's *Vicennalia* at Nicomedia and Rome, 327 and 328. It is valuable as containing extracts from such writers as Berosus, Sanchoniathon, Polyhistor, Cephalion, and Manetho. It was published in a complete state first by Mai and Zohrab, Milan 1818, from an Armenian MS. version discovered at Constantinople. (2) The *Præparatio Evangelica*, 15 books, a collection of such statements in old heathen authors as were fitted to make the mind regard the evidences of Christianity in a favorable light: it was translated into Latin, and appeared at Treviso 1480. The Greek text was published at Paris, 1544. (3) *Demonstratio Evangelica*, 20 books, intended to convince the Jews of the truth of Christianity from the evidence of their own Scriptures: a Latin version of this was printed as early as 1498; the Greek original did not appear till 1544, when it was published with the *Præparatio*, at Paris, by R. Stephens. (4) The *Ecclesiastical History*, 10 books: this relates the principal occurrences in the Christian Church till 324, and contains the results of Eusebius's studies in numerous libraries, and even in the imperial archives, Emperor Constantine having ordered, at Eusebius's request an examination of all documents relative to the history of martyrs. One drawback of the work is, that Eusebius, on principle, withholds all account of the wickedness and dissensions of Christians, inasmuch as he did not consider such stories for the edification of the church. A Latin translation by Rufinus was published at Rome 1474; the Greek text at Paris 1549, and Geneva 1612. Among more recent editions are those of Heinichen (Leip. 1827) and Burton (Oxford 1838). The *Ecclesiastical History* has been translated into English, German, French, etc. Besides the foregoing works, may be mentioned the *De Martyribus Palestinæ*, a book against Hierocles; another against Marcellus, and a *Life of Constantine*. The first edition of all Eusebius's works appeared at Basel 1542.

EUSE'BIUS, of Emisa: b. at Edessa, d. at Antioch, 360. He studied at Alexandria, and was pupil of Eusebius Pamphili, and friend of Eusebius of Nicomedia. Averse to all theological controversies, he declined the bishopric of Alexandria, vacant by the deposition of Athanasius. He was afterward, however, bp. of Emisa, but during his ordination, a Christian mob, accusing him of 'mathematics' and magic, created a tumult, and compelled him to flee for his life. Subsequently, he returned to Emisa, where he was 'tolerated,' in spite of his dangerous knowledge. Emperor Constantius was much attached to Eusebius, and

used to take him on his military expeditions. Eusebius was accused of Sabellianism (q.v.), and Jerome calls him 'the ringleader of the Arian party.' Jerome, however, was rash in his epithets, and it is more probable that he belonged to the party of his namesake of Cæsarea, the Semi-Arians, or peace-party, who wished the doctrine of the Godhead expressed in the language of Scripture, and not of human theology. The homilies extant under his name have been published by August (Elberf. 1829). The genuine ones show great eloquence.

EUSE'BIUS, of Nicomedia, Patriarch of Constantinople: b. toward the end of the 3d c., d. 342. First he was tutor to Emperor Julian, to whom he was related by the mother's side; then bp. of Beryta (Beyrout), in Syria, and afterward of Nicomedia. In order to secure his position, he appeared as the defender of Arius at the Council of Nice, and afterward placed himself at the head of the Arian party. Under Emperor Constantine, whom he baptized 337, he became patriarch of Constantinople. In the year before his death he held an assembly of the church for the establishment of Arianism at Antioch. It is not easy to perceive his real character. We have no ecclesiastical works by Arian writers, our only sources of information as regards the character and opinions of that party being their enemies—the orthodox party; yet, making the ordinary allowance for partisanship, there seems reason for concluding that Eusebius was cunning and double-tongued when occasion required, and imperious and violent when he had power in his hands. Athanasius considered him not the disciple, but rather the teacher of Arius. From him the Arians are sometimes styled Eusebians.

EUSKARIAN: term now often used for the Basque race (see BASQUE PROVINCES), especially in connection with the now prevalent theory, that peoples of this stock preceded the Aryans in w. Europe, and that even in England the Celts mingled with their Basque predecessors. Many ethnologists hold that in some parts of England, as s. Wales, the blood of the people is still mainly Euskarian.

EUSTACHIAN, a. *ū-stā'kĭ-ăn* [after *Eustāchĭŭs*, a celebrated Italian anatomist, A.D. 1574]: in *anat.*, applied to a tube or canal extending from behind the soft palate to the middle ear, to which it conveys the air (see EAR). EUSTACHIAN VALVE, a fold of the lining membrane of the heart: see FŒTUS.

EUSTACHIUS, *ūs-tā'kĭ-ŭs*, BARTOLOMMEO: Italian anatomist; b. in the early part of the 16th c., d. 1574. We learn that in 1562 he was prof. of medicine in the Collegio della Sapienza at Rome. His name is indelibly associated with anatomical science, through his discoveries of the tube in the auditory apparatus, and the valvular structure in the heart, which have been named from him. He was the first to give an accurate description of the thoracic duct, and probably the first to notice and describe the stapes (one of the chain of small bones crossing the tym-

panic cavity of the ear), a discovery which, however, Fallopius assigns to Ingrassias. He likewise contributed materially to the diffusion of more accurate knowledge regarding the development and evolution of the teeth, and the structure of the kidney. These discoveries are recorded in his *Opuscula Anatomica*, Venice 1563. He was the first anatomical writer who illustrated his works with good engravings on copper. The *Tabulæ Anatomicæ* which he was probably unable to publish in consequence of the poverty of which he complains in the introduction referred to, did not appear until 1714, when they were edited, with explanatory remarks by Lancisi. Their value is evidenced by the fact, that Albinus published a new edition, with an excellent Latin commentary, Leyden, 1743; that Bonn published a Dutch edition, Amsterdam 1798; and that a German edition appeared 1800. Lauth, in his *History of Anatomical Discovery*, remarks that if the *Tabulæ* had appeared in Eustachius's lifetime, anatomy would have attained its advancement in the 18th c., nearly 200 years earlier. Eustachius, Vesalius, and Fallopius may be regarded at the three founders of modern anatomy.

EUSTATHIAN, a. *ū-stā′thĭ-an:* in *chh. hist.*, pertaining or relating to any of the bishops called Eustathius: N. a name given by the Arians to the Trinitarians who followed Eustace, Bishop of Antioch, about the date of the Nicene Council, 325; also the followers of Eustathius, Bp. of Sebaste, in Armenia, or another Eustathius, of whom nothing definite is known. The former was a semi-Arian, of strong puritanic and ascetic views, who went the length of prohibiting marriage. He was deposed by the Council of Melitena, 357, and that of Neo-Cæsarea 358. His followers were condemned by that of Nicopolis, 372.

EUSTATHIUS, *ū-stā′thĭ-ŭs:* Greek commentator on Homer and the geographer Dionysius; b. Constantinople, d. 1198. He was first a monk, then a deacon and teacher of rhetoric in his native city, and, 1155, was appointed abp. of Thessalonica, where he died. Eustathius was profoundly versed in the ancient classic authors and a man of prodigious acquirements, as is proved by his commentaries. The number of authors whom he quotes is almost incredible and the value of his quotations is heightened by the consideration, that most of the works from which he extracts are no longer extant. His most important work is his *Commentary on the Iliad and Odyssey of Homer.* The first ed. appeared at Rome 1542–50; the last at Leip. 1825–29. The work is open to objection on the score of method, and is diffuse and digressive, but it is nevertheless a vast mine of knowledge for students of Homer. Of similar character is Eustathius's *Commentary on Dionysius*, printed first by Stephens (Paris 1547), and lastly, in Bernhardy's, edition of Dionysius (Leip. 1828). Of his commentary on the hymns of Pindar, only the *Proœmium* has come down to us. It was published first by Tafel 1832, with Eustathius's theological treatises and letters.

EUSTATHIUS, Saint, Bishop of Berrhœa, Syria, Patriarch of Antioch: b. Side, Pamphylia. He opposed the Arians with extreme vigor in the Council of Nicæa, and was rewarded with the patriarchate of Antioch 325. Five years later the Arians, in a synod at Antioch, secured his deposition on charges of Sebaliianism and unfaithfulness to his vows of celibacy; but the inhabitants arose in his defense, and by so doing provoked the emperor into banishing Eustathius to Thrace. A work against Origen, and an address to the emperor, delivered in the Council of Nicæa, are his only extant writings.

EUSTATIUS, *ū-stā′shē-ŭs.* St: one of the Dutch W. India Islands, near the n.e. bend of the great arch of the Antilles, about 12 m. n.w. of St. Christopher; lat. 17° 31′ n., and long. 63° 5′ w.; 8 sq. m. St. Eustatius is a pyramidal rock of volcanic formation, showing two extinct craters, and still subject to earthquakes. Hurricanes also of intense severity occur, particularly in August and September. Along its entire circuit of 29 m., St. Eustatius has only one landing-place which, besides being difficult of access, is strongly fortified. The whole mountain is fertile, producing in abundance not merely commercial crops, such as sugar, cotton, and tobacco, but also provisions of various kinds, such as maize, hogs, goats, and poultry. Pop. about 2,000.

EUSTIS, James Biddle: an American diplomatist; 1834, Aug. 27—1899, Sep. 9; was admitted to the bar, 1856, and practiced in New Orleans, La.; was judge-advocate on the staffs of the Confederate Gens. Magruder and J. E. Johnston, 1861–5; elected U. S. senator, 1876, to fill a vacancy; Prof. of Civil Law in the University of Louisiana, 1879–84, then re-elected senator; and was U. S. minister to France, 1893–7. In the latter year he resumed practice in New York city. He translated Guizot's *History of Civilization.*

EUSTYLE, n. *ū′stīl* [Gr. *eustulos,* with goodly pillars, with pillars at the best distances; *eu,* well, good; *stulos,* a pillar, a column]: in *arch.,* that style of intercolumniation in which the space between the columns was two and a quarter times their diameter. So called from this being considered the most beautiful style.

EUTASSA, n. *ū-tăs′sa* [Gr. *eu,* well; *tassō,* I arrange]: in *bot., Eutassa excelsa,* better known as *Auraucaria excelsa,* the huge Norfolk Island pine.

EU′TAW SPRINGS, Battle of: 1781, Sep. 8; near the Santee river, in S. C., 60 m. n.w. of Charleston; between 2,000 Americans under Gen. Greene, and 2,300 British troops under Col. Stuart. A reconnoitering detachment of British cavalry was first attacked and put to flight 4 miles from E. S. Gen. Greene then marched upon a body of infantry one mile from the British camp; drove them in and captured the camp; and while the Americans were plundering it, the British troops suddenly reformed and renewed the engagement, when Greene

withdrew the Americans out of range, with a view of attacking the British on their retreat. Stuart, however, retreated toward Charleston at night, leaving Greene to occupy the field the next day. British loss, killed, wounded, and prisoners, 633, American loss, killed, wounded, and missing, 535.

EUTERPE, n. *ū-tėr′pē* [Gr. *eu*, well; *terpein*, to delight]: in *anc. myth.*, one of the nine Muses, daughter of Zeus and Mnemosyne. She was the Muse of lyric poetry, presided over wind instruments, and music generally, and is represented in ancient art with a flute in her hand: see MUSES. EUTER′PEAN, a. *-pē-ăn*, pertaining to music.

EUTERPE, *ū-tėr′pē:* genus of palms, having male and female flowers intermingled on the same spadix, the spadices springing from beneath the leaves, the spathe entire, membranaceous, and deciduous. They are very elegant palms; with lofty, slender, smooth, faintly ringed stems; and pinnate leaves, forming a graceful, feathery plume; the bases of the leaf-stalks sheathing far down the stem, and so forming a thick column several ft. in length at its summit. To this genus the cabbage palm of the W. Indies, and the Assai palm of the banks of the Amazon, are often referred. See ARECA: ASSAI.

EUTHANASIA, n. *ū′thăn-ā′zhĭ-ă*, or EUTHAN′ASY, n. *-ă-sĭ* [Gr. *euthanasia*, an easy death—from *eu*, well; *thănătos*, death]: an easy, happy death.

EUTROPHIC, n. *ū-trŏf′ĭk:* in *path.*, agent which acts upon the nutritive system, without occasioning manifest increase of any of the secretions as a necessary consequence.

EUTROPHY, n. *ū′tro-fĭ* [Gr. *eu*, well, good; *trephō*, I nourish]: in *path.*, a healthy state of the nutritive organs; healthy nutrition.

EUTROPIUS, *ū-trō′pĭ-ŭs:* Latin historian, concerning whom we know only that he was sec. to Emperor Constantine, fought against the Persians under Julian, and was still living in the reign of Valens. His *Breviarum Historiæ Romanæ*, a short narrative of Roman history from the foundation of the city to the time of Emperor Valens, is written in an extremely simple and pure style, and appears to have been intended originally for the use of schools. It became very popular as the taste for original investigation declined, in that dark period between the death of the old world and the birth of the new; and is either copied or followed by the early monkish annalists. An ed. with enlargements, however, was published by Paul, son of Warnefrid ud Theodolinda, generally known as Paulus Diaconus. Others continued it down to 813. The History existed in three distinct forms at the revival of letters: there was first the genuine work of Eutropius in ten books; second, the expanded editions of Paul; and third, a very complete, but largely interpolated copy in the *Historia Miscella*. The *editio princeps*, Rome 1471.

was from the impure text of Paul. The best editions in modern times are those of Tzschucke (Leip. 1796, improved 1804), and of Grosse (Halle 1813; Leip. 1825).

EU'TYCHES: Byzantine ecclesiastic of the 5th c.; zealous but unskilful representative of the dogmatic opinions of Cyril of Alexandria. In opposing the doctrines of Nestorius, he fell into the opposite extreme, and taught that after the union of the two natures in Jesus Christ, the human nature was absorbed in the divine; an opinion which spread extensively through the Alexandrian Church. Eutyches was in consequence summoned before a synod at Constantinople 448, and deposed by Flavianus, patriarch of that city; but his cause was warmly espoused by the eunuch Chrysaphius, chief minister of Emperor Theodosius II., and Dioscurus, Bp. of Alexandria—both opposed to Flavianus. Chrysaphius induced the emperor to call a general council at Ephesus in the following year, under the presidency of Dioscurus. Measures were taken beforehand to secure a triumph over the anti-Eutychians. Soldiers were admitted to the deliberations of the council, to overawe the party of Flavianus; while a crowd of fierce Egyptian monks, devotedly attached to whatever was popular in Alexandria, or had been countenanced by their old pupil Cyril, drowned by their fanatical outcries the voices of those who ventured to speak against Eutyches. See EPHESUS, COUNCILS OF. The result was that the judgment of the previous council was reversed; Flavianus and his adherents were deposed, and the doctrine of Eutyches affirmed orthodox, and in accordance with the Nicene creed. His triumph, however, lasted only two years; in 451, Eutychianism was pronounced heresy at the Council of Chalcedon, attended by 650 bishops; and in opposition to his views, it was declared that in Christ the two natures were united without confusion or conversion of substance. Nothing further is known concerning Eutyches except that Leo wrote to Emperor Marcian to banish him from the capital. The sect of Eutychians, however, under the name of Monophysites (q.v.) continued quietly for a century after his death, in the Armenian, Ethiopian, and Coptic churches, when it awoke to new life under the auspices of Jacob Baradæus, who died bp. of Edessa, 588. His followers were called Jacobites, and have perpetuated the Monophysite doctrine in the Armenian and Coptic churches to the present day. See Neander, *Kirchengeschichte*, III., p. 1079, etc. EUTYCHIANS, n. plu. *ū-tĭk'ĭ-anz*, heretics of the 5th c., followers of Eutyches: see MONOPHYSITES. EUTYCHIANISM, n. *ū-tĭk'ĭ-an-ĭzm*, the doctrines of Eutyches, adherence to his doctrine.

EUXENIA, n. *ūks-ĕn'ĭ-a* [Gr. *eu*, beautiful; *xenos*, a guest, a friend]: typical genus of *Euxenieæ*, sub-tribe of *Senecionideæ*. Euxenia consists of two Chilian shrubs with aromatic leaves.

EUXINE, *ūks'ĭn* [Gr. *Euxinos*, hospitable]: ancient

name of the Black Sea (q.v.). Before receiving this name it was called *Axenos Pontos*, the inhospitable sea, because of the black and turbulent weather so frequently ascribed to it by the ancient poets, and the reported cannibalism of the Scythian tribes who lined its n. shores. It seems to have been called the *Euxine*, or hospitable sea, after the etablishment of Greek colonies on its borders, when its waters were thrown open to Greek commerce.

EUYUK, or UYUK: village of Asia Minor, 28 m. s. of the Kizil Irmak river, 75 m. w.s.w. of Amasia; on a small spur of a succession of high hills, ranging n. Though containing only a score of buildings, it is noted for its singular ruins, which have excited all manner of historical conjectures. The remains are those of a large edifice, and comprise blocks of granite of colossal size, which display with remarkable clearness a great variety of sculptures. The building resembles an Assyrian palace in form and divisions, with the upper part of its walls fashioned in clay. The most plausible conjectures are (1) that it was erected by artisans, who had been employed in building the palaces at Nineveh, and (2) that it was a temple, erected by Egyptians at the time of their earliest conquests in Asia Minor. If the former be true, the builders here adopted Egyptian figures and emblems, as they did elsewhere; if the latter, they added their own sphinx and human figure sculptures to the usual form of large Assyrian buildings.

EVACUATE, v. *ĕ-văk′ū-āt* [L. *evacŭātŭs*, emptied out—from *e*, out of; *vacŭŭs*, empty: It. *evacuare:* F. *évacuer*]: to make empty; to quit; to eject or void; to empty; to withdraw from, as troops from a fortress. EVAC′UATING, imp. EVAC′UATED, pp. EVAC′UATOR, n. *-tėr*, one who, or that which. EVAC′UA′TION, n. *-ā′shŭn* [F.—L.]: an emptying; a retiring from; voidance; discharge of fæces from the body. EVAC′UATIVE, a. *-ā-tĭv*, that evacuates. EVAC′UANT, a. [F.—L.]: emptying: N. a medicine used for producing evacuation.

EVADE, v. *ĕ-vād′* [F. *évader*, to evade, to escape—from L. *evādĕrĕ*, to go forth or out—from *e*, out of; *vādō*, I go: It. *evadere—lit.*, to go forth or out]: to avoid or escape by artifice or dexerity; cleverly to escape from; to elude; to slip away; to equivocate. EVA′DING, imp. EVA′DED, pp. —SYN. of 'evade': to escape; shun; avoid; eschew; prevaricate; shuffle.

EVAGRIUS, *ĕ-vā′grĭ-ŭs:* lawyer and historian: b. in Epiphania, Syria, 536. He practiced law in Antioch, became legal adviser of Gregory, patriarch of that city, and defended him with such ability that he was appointed prefect of the city by the emperor. His influence and popularity were attested by a public festival in his honor on the occasion of his second marriage He is known chiefly by his *Ecclesiastical History*, an extension of the histories of Socrates and Theodoret, in 6 books, covering

the period 431–594. An edition was published by Reading (Cambridge 1720).

EVALUATION, n. *ĕ-văl′ū-ā′shŭn* [L. *e*, out of, and *valuation*]: exhaustive valuation.

EVANDER, *ē-văn′dėr:* semi-mythical Grecian hero of antiquity, according to Roman traditions, son of Hermes, by Carmenta or Tiburtis. About 60 years before the Trojan war, he is said to have led a Pelasgian colony from Pallantium, in Arcadia, to Italy, and to have landed on the banks of the Tiber, and near the foot of the Palatine Hill. Here he built a town, naming it Pallantium, after the one in Arcadia. At a later period, it was incorporated with Rome, and is affirmed to have originated the names Palatinus and Palatium. Tradition represented Evander as having done much to introduce the habits of social life among his neighbors; he prescribed for them milder laws, and taught them, among other arts, those of music and writing. To him is ascribed also the introduction of the worship of the Lycæan Pan, with that of Demeter, Poseidon and other deities. Virgil represents him as still alive when Æneas arrived in Latium after the sack of Troy. Evander was worshipped at Pallantium in Arcadia, and at Rome.

EVANESCENT, a. *ĕv′ă-nĕs′ĕnt* [L. *evanĕscĕn′tem*, vanishing or passing away—from *e*, out of; *vanĕscō*, I vanish: F. *évanouir*, to vanish]: vanishing; fleeting; momentary; passing away. Ev′ANES′CENCE, n. *-ĕns*, the being liable to pass away; a vanishing; the act of passing away. Ev′-ANES′CENTLY, ad. *-ĕnt-lĭ*. EVANESCENTI, prefix, *ĕv-a-nĕs-sĕn-tĭ* [L. *evanescens*]: evanescent. EVANESCENTI-VENOSE, a. *-vē′nōs*, in *bot.*, having such a venation that the lateral veins disappear within the margin.

EVANGELIC, a. *ē′văn-jĕl′ĭk*, or E′VANGEL′ICAL, a. *-ĭ-kăl* [F. *évangélique*—from L. *evangĕlĭcus*—from Gr. *eu*, well, good: *anggello*, I bring tidings, I announce]: according to the doctrines and precepts of the Gospel; orthodox; a designation assumed by those churches whose creeds include a belief in the Trinity, the atonement, and regeneration. E′VANGEL′ICALLY, ad. *-lĭ*. EVANGELIZE, v. *ē-văn′jĕl-iz*, to convert to Christianity; to instruct in the Gospel. EVANGELI′ZING, imp. EVAN′GELIZED, pp. *-īzd*. EVAN′GELIZA′TION, n. *-jĕl-ī-zā′shŭn*, the act of converting to Christianity. EVAN′GELIST, n. one who brings good tidings; a preacher of the Gospel; one of the four Gospel-writers. EVAN′GELISM, n. *-ĭzm*, the spreading of the knowledge of the Gospel. EVANGEL, n. *ē-văn′jĕl*, good news, especially that of the Gospel—used in poetry. EVANGELY, n. *ē-văn′jĕl-ĭ*, in *OE.*, good tidings; the Gospel message.

EVANGEL′ICAL: adjective applied in general to anything which is marked by the spirit of the gospel of Jesus Christ; e.g. an evangelical sermon, evangelical piety, evangelical views, etc. The term 'evangelical,' however,

is used by a large portion of the religious community to denote, not merely a spirit or sentiment resembling that of the Savior, but that spirit or sentiment viewed as resulting from, or as necessarily accompanied by, an assured belief in the grand facts of Christ's redemption. These facts, variously stated and with different emphasis on one or another point, are such as the universal sinfulness and peril of man; God's gracious redemption of man through the sacrifice of Christ, whose benefits are freely offered to all who will accept them by faith; the regenerating power of the spirit of God, given through Christ, to lead men into the new life of faith and love; a future of rewards and punishments unending, beyond the grave, to be rendered to every human soul, according to the just judgment of God. With these, is involved the acceptance of the authoritative revelation and binding precept of God as given in the Bible, and an acceptance of the scriptural revelation of the one God as the Father and the Son and the Holy Spirit. The word 'evangelical' has less strictness and smaller range of doctrine than 'orthodox,' while it involves more direct reference to character and life. 'Orthodoxy' may be said to include whatever doctrines are held to constitute the only true and complete expression of Christian belief. In England and Scotland, dissenters have generally laid claim to be considered more 'evangelical' than the national churches. In the Anglican Church, however, the rise of the Puseyite or Tractarian party has brought into prominence an antagonistic party, resembling dissenters very much in their theological tenets. This party calls itself, *par excellence*, 'Evangelical,' and has been criticised as expending much of its strength in antagonism to the ritual party and practices.—In Germany, all Protestants call themselves Evangelical, in opposition to Rom. Catholics on the ground that the Reformers taught the pure gospel of the grace of God in Christ, cleansing it of all human corruptions. The modern orthodox or pietistic party in the German Prot. churches have of late made exclusive claim to the attribute Evangelical, on the ground that they alone hold to the gospel in its actual historical shape. This claim is naturally disputed by the 'liberal' theologians.—In a general doctrinal sense, 'Evangelical' is used in distinction from Rom. Catholic, Unitarian, and Universalist systems; but not as excluding such individual adherents of those systems as show an evangelical or gospel spirit.

EVANGEL'ICAL ALLI'ANCE: association formed in London, 1846, Aug., to promote a more practical union among Protestants, a closer Christian fellowship, and a wider extension of the Christian faith. At the first meeting about 800 delegates were present, including many eminent men from Great Britain, France, Germany, Switzerland and the United States; and representing Episcopal, Presbyterian, Congregational, Methodist, Baptist, Lutheran, Reformed, Moravian, and other

churches. The following summary of doctrines regarded as essential by those who form the alliance was adopted: (1). The divine inspiration, authority, and sufficiency of the Holy Scriptures. (2). The right and duty of private judgment in the interpretation of the Scriptures. (3). The unity of the Godhead, and the trinity of persons therein. (4). The depravity of human nature in consequence of the fall. (5). The incarnation of the Son of God, his work of atonement for the sins of mankind, and his mediatorial intercession and reign. (6). The justification of the sinner by faith alone. (7). The work of the Holy Spirit in conversion and sanctification. (8). The immortality of the soul, the resurrection of the body, the judgment of the world by our Lord Jesus Christ, with the eternal blessedness of the righteous, and the eternal punishment of the wicked. Branch alliances have since been formed in Great Britain, Germany, France, Switzerland, Spain, Belgium, Holland, Italy, the United States, Australia, and among missionaries in Burmah, Siam, China, Ceylon, India, Turkey, Syria, Egypt, Africa, and other distant lands. These national branches have charge of the work in their respective countries; and delegates from them meeting together, form a Protestant 'ecumenical council,' which exercises only moral and spiritual power, to the exclusion of all ecclesiastical authority. These councils have been held at average intervals of 4 or 5 years. That at New York, 1873, Oct., remarkable as the first assemblage in the western hemisphere of Christians from all parts of the world, was attended by more than 500 delegates, many of whom were men very highly distinguished in church and state. For ten days, in the midst of large and enthusiastic congregations, they deliberated together on the religious condition of Christendom, Christian union, Christian life, and on Christianity in its relations to unbelief and error, to science, civil government, philanthropy, and the reform of social evils. At the close of the sessions, the council, by invitation, proceeded to Princeton, Philadelphia, and Washington; in all of which places highly interesting meetings were held. In 1887, Dec., the branch Alliance for the United States held, at Washington, D. C., a general conference, which was very largely attended by representative men of all Prot. denominations, who, during three days, earnestly and thoroughly considered the following topics: (1). The present perils of Christianity in the United States. (2). Its great opportunities. (3). The imperative need of the active co-operation of all Christian churches, and the best means for securing it. Some of the results of E. A., already seen, are: (1). An increase of earnest and systematic work in evangelizing more thoroughly nominally Christian countries, and in establishing Christianity in heathen lands. (2). A growth among all denominations, of Christian fellowship, of co-operation in Christian work, and of effort to secure a more pronounced outward expression of Christian unity. (3).

Successful endeavors to promote religious liberty in quarters where it is denied or threatened; for example, in Turkey, Japan, the Baltic provinces of Russia, and some parts of southern Europe.

EVANGEL'ICAL ASSOCIA'TION (sometimes inaccurately called the German Methodist Church): a union of Christian churches, organized in 1800. The Rev. Jacob Albright (1759–1800, b. Penn.) of eastern Penn. began, about 1790, to preach among the Germans around him, in order to raise their standard of doctrinal belief and of moral conduct. He continued this work successfully for 10 years, gradually enlarging the range of his travels and the number of persons brought under his influence. At length, to meet the exigencies of the case, he gathered his scattered converts into little companies for mutual comfort and help. These were soon found to need some bond of union for edification and strength. A general meeting was therefore, called, to consider the best methods for promoting their welfare and work. The first thing done by the assembled people was to choose Mr. Albright as pastor and bishop; ordaining him to the ministry, and clothing him with authority over themselves, in subjection to the Scriptures as their only rule. Subsequently, they adopted a creed and form of church order, in accordance with their views of Scripture truth. The creed is described as steering between Calvinism and Arminianism; in church order, they resemble the Meth. Episc. Church, their ministers being itinerant, and having among them no higher order than that of 'elders.' As their numbers increased they organized annual conferences; and, since 1843 have held, every four years, a general conference of delegates from the annual conferences. They have presiding elders and bishops; both classes being elected for a term of four years, at the expiration of which, unless they are re-elected, their authority ceases. For the first 25 years they encountered many difficulties and great opposition; but, since that time, have had a prosperous course. Their membership is no longer confined as at first to German immigrants and their German-speaking descendants. As from the beginning they denounced slavery, they made progress only in the free states and Canada. They prosecute the work of missions at home and, to some extent, also abroad. They are friends of education, and sustain several literary institutions, among which is a college at Naperville, Ill. They forbid the use of intoxicating liquors as a beverage by their ministers and members; and exclude the dealers in them from church fellowship. 1902 official reports showed ministers, 920; churches, 1,659; communicants, 98,641.

EVANGEL'ICAL COUNSELS: in the Rom. Cath. Church, certain admonitions taken from the N. Test. and recommended for the observance of all who wish to attain a superior degree of holiness. They are classed as non-obligatory rules, in contra-distinction to the command-

ments and precepts (obedience to which is held to be an absolute necessity), and originally took the form of 3 vows: to renounce riches for voluntary poverty, pleasure for perfect chastity, and self-will and love of power for obedience to a religious superior. Subsequently the vows were increased to 12. When a certain ruler put to Jesus Christ the question: 'What good thing shall I do that I may inherit life?' and received the answer: 'If thou wilt enter into life, keep the commandments,' he was taught the condition of salvation which applies to all mankind. But he wanted to know whether there is not a more excellent way: he had 'observed all those things from his youth up'; and was not there some other 'good thing' for him to do? Then Jesus prescribed to him the perfect way: 'Sell all that thou hast and distribute unto the poor,' giving him one of the Evangelical Counsels, the counsel of voluntary poverty. The celibate life is commended by St. Paul as more favorable to entire devotion to the service of God than the state of marriage: the Evangelical Counsel is the principal topic of the epistle of 1 Corinthians. Finally, entire obedience is the third of those counsels—renunciation of self-will, cheerful submission to the rule of superiors. (See Matt. v. 29, 35, 39, 42; xix. 11, 21; xxv. 21; Lk. xiv. 26; xvii. 10; I. Cor. vii. 10, 25; I. Tim. iv. 3).

EVANGEL'ICAL UNION: religious body constituted in Scotland 1843 by the Rev. James Morison of Kilmarnock, and three other ministers (with their respective adherents), who had been separated from the United Secession Church for doctrinal views, of which the fundamental and determining article was the strict universality of the Savior's atonement. Coeval with the body is its Theological Academy, and attended by more than 20 students annually. They were soon joined by a number of ministers and churches of the Congregational Union of Scotland, and have since extended themselves considerably in Scotland and the n. of England. Their church government is congregational, though many congregations have ruling elders. Their doctrinal views are exhibited in an authorized publication, *Doctrinal Declaration*, 1858.

EVANGELINE, the heroine of one of Longfellow's earlier narrative poems, to which her name is given. It is written in English hexameters, and describes, although with little real topographical delineation of scenery, the deportation of the Acadians by the English government in 1775.

EVAN'GELIST: literally, bringer of good tidings, designates, in the New Testament, a person appointed by an apostle to itinerate among the heathen, and so prepare the way for resident Christian instructors. The evangelist, therefore, had no particular flock assigned to him, and is thus distinguished from bishops, or pastors, whether of larger or smaller territories. Later in the history of the early, church, the evangelist figures, according to Eusebius, as 'a deliverer of the written gospels to those who were

ignorant of the faith.' This may possibly imply that he acted as a colporteur, by distributing copies of the gospels, or that he read them to the heathen, and so made them familiar with their contents. In modern usage, E. has come to signify one of a class of revivalists, preaching zealously for a longer or shorter period in a place, often under direction of the local minister, sometimes independently, and aiming by pungent sermons and fervent appeals to bring to pass a multitude of immediate conversions. In the Church of England, and affiliated churches, these are known as *Missioners*, and have had great success in recent years.—The word evangelist is specially applied to the four writers of the life and gospel of Jesus Christ, these being evangelists ('bringers of good tidings') *par excellence*.

EVAN'GELISTS, Symbols of the Four: symbols in sacred art. *Jointly:* 4 scrolls placed in the 4 angles of a Greek cross; 4 books (the Gospels); 4 rivers rising in Paradise; 4 beasts (Rev. iv. 7), typifying Christ's Incarnation, Passion, Resurrection, Ascension; the tetramorph, or union of the 4 attributes of the evangelists into a single winged figure; 4 human figures, but with animal heads, each holding an open book. *Separately:* Matthew: cherub; human figure, head in halo, carrying tax-collector's bag; human figure writing in a book from an angel's dictation; Mark: lion; lion flying with double wings, head in halo, fore-claws holding book; lion-head, human shoulders and arms holding book; wings; figure in pontificals of a Greek bp.; Luke: ox; head of ox with wings; ox-head with wings flying between 5 stars; artist painting the Virgin's portrait; hooded figure seated on an ox and writing in a book; John: eagle; eagle soaring with double wings, head in halo; human figure with eagle-head in halo; aged man, white hair; young man, beardless; human figure writing, devil stealing inkhorn; draped figure, pensive, bearing the sacramental cup from which a serpent is emerging.

EVANIA, n. *ē-vā'nĭ-a* [Gr. *euanios*, taking trouble easily; *eu*, easily; *ania*, grief, trouble]: typical genus of *Evaniidæ*, a family of hymenopterous insects, tribe *Entomophaga*. They have the abdomen attached to the upper surface of the meta-thorax, and the antennæ straight.

EVANISHMENT, n. *ē-văn'ĭsh-mĕnt:* a vanishing or disappearing from sight; disappearance; evanescence.

EVANS, *ĕv'ans* or *ĕv'anz*, Lieutenant-General Sir De Lacy, G.C.B.: 1787–1870, Jan. 9; b. Moig, Ireland. He entered the British army as ensign 1807; in 1812, joined the 3d light dragoons, with whom he saw much Peninsular service. In 1814, he was brevet lieut. in the war with the United States. He was next at Waterloo. In 1830–1, he sat in parliament for Rye, and 1833 was elected on the liberal interest for Westminster, which he represented until 1841. The command of the British auxiliary legion in aid of the cause of the young queen of Spain, was offered to E., and he was allowed by his constituents to accept it without vacating his seat for Westminster. E.'s principal military ex-

ploits at the head of the British Legion were the storm and capture of the Carlist lines of Ayetta, near St. Sebastian, 1836; the storm and capture of Irun; and the capture of Oyarzun and Fontarabia. On declaration of war against Russia, he was appointed to command the 2nd division of the army sent out to Crimea, with the rank of lieut.-gen. In 1855, Feb., E. received the public thanks of the house of commons, for his services in the Crimea.

EVANS, Frederick William: elder in the Society of Shakers; b. Leominster, England, 1808, June 9. He was brought up on a farm, came to the United States with his father, 1820; learned the hatter's trade; taught himself to read, and studied the works of Owen, Fourier, and other advocates of social reform. After a brief visit to England, he joined the community of Shakers at Mount Lebanon, N. Y., 1850, June 3, and subsequently became assistant elder in the 'North Family' (1838), first elder of three 'families' (1858), and the leader of the sect in the United States. Evans lectured frequently on the dogmas of his sect, and published *Compendium of Principles, Rules, Doctrines, and Government of Shakers*, with biographies of early and leading Shakers (1859); *Autobiography of a Shaker*, and *Tests of Divine Revelation* (1889), etc. He died, 1893, March 6.

EVANS, John: an American philanthropist; 1814, Mar. 9—1897, July 3; studied medicine and practiced in Ottawa, Ill. In 1848 he accepted a professorship in the Rush Medical College, Chicago, in which city he acquired a large fortune by investments in real estate. He founded the Northwestern University, and endowed two chairs there with $50,000 each. He was appointed governor of Colorado Territory, 1862, and later founded the University of Denver, giving $200,000 toward its construction and largely endowing it.

EVANS, Marian (*nom de plumē*, 'George Eliot'): one of the greatest of English novelists, and probably the foremost literary woman of her age: 1820, Nov. 22—1880, Dec. 22; b. Griff, near Nuneaton, youngest daughter of a Warwickshire land-agent. Her education, begun at Coventry, embraced music, French, German, Italian, Greek, and Latin; Spanish and Hebrew were later acquirements. Her translation of Strauss's *Leben Jesu*, published 1846, was her first literary effort. Her reading in history, science, speculative philosophy, and theology was very extensive; and when in 1851 she settled in London as assistant to Dr. Chapman, editor of the *Westminster Review*, Herbert Spencer has testified that she 'was already distinguished by that breadth of culture and universality of power which have since made her known to all the world.' Her translation of Feuerbach's *Essence of Christianity* appeared 1853. In 1856, G. H. Lewes forwarded to the Messrs. Blackwood the first instalment of *The Scenes of Clerical Life*, which appeared next year in *Blackwood's Magazine*

with the now familiar signature of 'George Eliot.' These proclaimed with great distinctness the advent of a new novelist of fresh and original power. It was from the first well understood that the signature was a mere *nom de plume;* and no little curiosity was excited as to the personality of the author unknown. That feeling was much deepened by the publication, 1858, of the novel of *Adam Bede,* which attained an immense success, and at once secured for the writer almost undisputed rank with the most eminent novelists of the day. This was followed, 1859, by *The Mill on the Floss,* which amply sustained the reputation of the writer; and, 1861, by *Silas Marner, the Weaver of Raveloe,* one volume. In 1863, *Romola,* an elaborate historical novel of Italian life, illustrating the times of Savonarola, was published in the *Cornhill Magazine.* This work has never had the popularity of its predecessors, but was considered by some the greatest effort of the author. It had by this time become certain that Miss E. was the 'George Eliot' of these works; and by not a few competent critics a place had been assigned her at the very summit of this branch of literature. *Felix Holt, the Radical,* published 1866, was almost everywhere received with acclamation. *Middlemarch, a Study of English Provincial Life,* published at intervals in 8 divisions, 1871–2, enhanced the author's great reputation. It has sometimes been spoken of as her chief triumph; though the palm is generally assigned to *Adam Bede. Daniel Deronda* was published at intervals in 1876. In its chief characters are sympathetically idealized the history, character, and aims of the Hebrew race—a unique and daring artistic conception. Of the poems, *The Spanish Gypsy* was published 1868; *Agatha,* 1869; *the Legend of Jubal,* 1870; and *Armgart,* 1871. Meanwhile the distinguished authoress had for years been known to a wide circle of friends as the wife of George Henry Lewes (q.v.), who died 1878. In 1879 she published a vol. of essays, *The Impressions of Theophrastus Such;* another vol. of essays appeared 1884. In 1880 she married Mr. J. W. Cross. See her *Life,* drawn almost wholly from her letters and journals, by Mr. Cross (1885); and a short life by Miss Blind (1883). Her poems, though marked by many of the highest qualities of true poetry, have missed success. They and her novels, whether those founded on memories of English life in the Midland Counties, or the romances of pure historic imagination, have many qualities in common. 'George Eliot's' work is remarkable not only for nobility of tone, wealth of pregnant suggestion, and subtlety of insight, but for tenderness of feeling, keen sense of humor, delicacy of treatment, and width and variety of sympathy. Earnest purpose is manifest; but the lighter gifts of the novelist are used with grace and effect, The style is pure and forcible. The interest centres largely in character struggling with circumstance, sometimes succumbing to fate, and generally molded or modified by surroundings. Egoism is everywhere revealed as the great canker of life. 'George Eliot' had a keen sympathy with the ethical elements of the

'Religion of Humanity;' her Positivist beliefs she does not obtrude on her readers. These beliefs, towards which she seems to have been tending since about 1829, were confirmed after 1851, during her assistant editorship of the *Westminister Review*, by her intimacy with Herbert Spencer, Mill, and others of that school. Her example has done much to forward the cause of woman's culture, and her personal character was genial.

EVANS, Oliver: 1755–1819, Apr. 25; b. Newport, Del.: inventor. He learned the wheelwright's trade, invented a machine for making card teeth when 22 years old, became associated with his brothers in a flour-mill when 24, and within a few years devised improvements for his business, comprising an elevator, hopper, drill, and descender, which radically changed the process of manufacturing flour. As early as 1772 he began experimenting to produce a substitute for animal power in moving wagons, and in 1780 completed the first high-pressure steam engine in the United States. During 1803–4, he planned and built for the Philadelphia board of health, the first steam dredging machine used in the United States; and, by connecting his engine by pulleys and bands with four wooden wheels placed beneath the scow, and also with a paddle wheel behind it, was able to move his singular apparatus equally well over land and water. He thus became the originator of locomotion by steam power. He was desirous to build a railroad between Philadelphia and New York, but was prevented by lack of money.

EVANS, Robley Dunglison: an American naval officer; b. 1846, Aug. 18; was graduated at the U. S. Naval Academy, 1863; promoted ensign, 1863, Oct. 1. During the civil war he participated in the assault on Fort Fisher, 1865, Jan. 15, and in the land engagement received four wounds. He was promoted lieut., 1866, July 25; lieut.-commander, 1868, Mar. 12; commander, 1878, July. He was in command of the *Yorktown* at Valparaiso, Chili, 1891, during the strained relations between the United States and that country. On 1893 June 27, he was promoted capt., and on 1898, July 3, commanded the *Iowa* in the battle off Santiago de Cuba, in which the Spanish fleet was destroyed. He became rear-admiral, 1901, and in the same year published *A Sailor's Log.*

EVANS, Thomas Williams: an American dentist; 1823, Dec. 23–1897, Nov. 14; b. in Philadelphia, Pa. After working for some time with a goldsmith and dental plate-maker, he studied dentistry, and made a specialty of saving teeth by filling. In 1848 he was called, as the most skilful American dental surgeon, to go to Paris to attend to the teeth of President Louis Napoleon; and while there acquired a large fortune, which he bequeathed to trustees to establish a museum and institute in Philadelphia. He was the organizer and an influential promoter of the U. S. Sanitary Commission in the civil war; a founder of the French Red Cross Society, and the

director of its ambulance corps in the Franco-Prussian war.

EVANSTON, *ĕv'anz-ton:* town of Cook co., Ill.; on Lake Michigan; on the Milwaukee division of the Chicago and Northwestern railroad; 12 m. n. of Chicago. It is delightfully situated and laid out, is lighted with gas and electricity, has electric and elevated railroad service with Chicago, Holly system of waterworks. It is an important educational and residential suburb of Chicago, with the Northwestern Univ. (Meth. Episco.) founded in 1854, richly endowed and well equipped; Garrett Biblical Institute; Winchell Academy; Evanston College for Women, founded 1871; R. C. Visitation Academy; and the Dearborn Observatory, transferred from Chicago in 1888 and made a department of the Northwestern Univ. Pop. (1900) 19,289; (1910) 24,978.

EVANSVILLE, *ĕv'anz-vĭl:* city, cap. of Vanderburg co., Ind.; on the O. river, 192 m. above Cairo and 185 m. above Louisville; on the Evansville and Terre Haute, Louisville, Evansville and St. Louis, Louisville and Nashville, and Lake Erie and Southwestern railroads; a port of entry, and the second city in the state. It is on a high bank at a bend of the river, midway between the falls and its junction with the Mississippi; is the geographical centre of a rich and fertile agricultural region, accessible in every part by navigable streams, as well as by lines of railroad; and is in the midst of the great coal fields of the west and southwest; hence, it has unusual advantages as a manufacturing and shipping point, exporting large quantities of coal, timber, grain, flour, pork, tobacco, and the products of its industrial establishments. Recent statistics give Evansville 705 manufacturing establishments, employing 7,279 persons and $10,059,375 capital, with an annual output valued at $14,193,320. The principal industries are stove and hollow-ware works, engine and machine shops, plow factories, boiler yards, sheet iron, tin, and copper works, sawmills with extensive lumber yards, carriage and wagon factories, furniture factories, coopering houses, marble yards, cigar factories, brick-yards, breweries, malt-houses, flour-mills, tanneries, soap-factories, broom-factories, saddlery shops, large woolen and cotton mills, saw factory, fireproof safe factory. Among notable buildings are the U. S. custom house and post-office, U. S. mar. hospital, theatres, several public halls, including one exclusively for temperance meetings and purposes, the Willard library and art gallery (endowment $500,000), city hall, court-house, and libraries. There are many handsome denominational churches, including: Meth. Episc., Bapt., Presb., Rom. Cath., Lutheran, Prot. Episc., German Evang., Jews, Christian, German Evang. Assoc., Ref. Ch. in the U. S., and Free Meth. There are also public school buildings, including a high school for white pupils and another for colored, and denominational schools. Evansville has municipal waterworks, gas and electric lighting and electric street

railroads. The public lands in the s.w. of Indian Terr., along the Ohio and Wabash rivers, were surveyed 1860–09. As soon as they were offered for sale, Col. Hugh McGary, of Ky., secured patents for a large tract that included the site of Evansville, erected the first house on the banks of the Ohio 1812, and began clearing the land. Ind. was admitted into the Union 1816, Dec., and in the following spring Col. McGary sold half of his town site to Gen. Robert M. Evans and James W. Jones, by whom it was named Evansville. It was incorporated as a town 1819, and as a city in 1847. Pop. (1910) 69,647.

EVAPOMETER: same as EVAPOROMETER.

EVAPORATE, v. *ĕ-văp′ō-rāt* [L. *evăpōrātus*, dispersed in vapor—from *e*, out of; *vapŏr*, vapor: It. *evaporare:* F. *évaporer*, to evaporate—*lit.*, to disperse in vapor]: to pass off in vapor or fumes; to dissipate in fumes; to give vent to; to pour out in words or sounds, not in action; to pass off without effect. EVAP′ORATING, imp. EVAP′ORATED, pp. EVAP′ORA′TION, n. *-rā′shŭn* [F.—L.]: the conversion of a liquid into vapor. EVAP′ORABLE, a. *-rā-bl*, that may be converted into a vapor. EVAP′ORATIVE, a. *-rā-tĭv*, causing evaporation. EVAP′OROM′ETER, n. *-rŏm′ĕ-tėr* [Gr. *metron*, a measure]: an instrument for measuring the rate of fluid evaporation.

EVAPORATION: the conversion of a liquid into vapor. If a solid be directly vaporized the process is called SUBLIMATION (q.v.). When the vapor of the liquid is condensed back to the liquid form, the term DISTILLATION (q.v.) is employed, whereas when the liquid is contained in the pores of a solid, so that the latter does not appear wet, the conversion of the former mechanically into vapor is classed as *desiccation* or *drying*. All liquids give off vapor at any temperature, the quantity increasing as the latter rises, in many cases, however, the quantity of such vapor is so small as to be of no importance. It is convenient to express this quantity by the pressure which it can exert and the pressure is measured by the weight of a column of mercury which it can support. When the pressure is equal to one atmosphere the liquid *boils*. Hence, the boiling point of a liquid is defined as the temperature at which the pressure of its vapor is equal to that of the pressure upon it. It follows, therefore, that the boiling point of a liquid may be raised by increasing the pressure, as in a steam boiler. It may, however, also be lowered by reducing the pressure. This is often done where evaporation is necessary at a relatively low temperature, as in the manufacture of sugar. The change from liquid to vapor is accompanied by an absorption of heat, this heat is abstracted from surrounding objects, or from the liquid itself, so that if the evaporation be sufficiently rapid, water, for example, may be frozen by its own evaporation. A familiar example of this absorption of heat is the cooling of a wet cloth by waving it in air, or the cooling of food by wrapping it in a wet

cloth and placing it in a draught. In Egypt and the East water for drinking is cooled by being placed in porous vessels and exposed to air. The water gradually penetrates the vessel, is evaporated on the outer surface and so the temperature of the vessel and contents is reduced. In order that evaporation may be rapid it is necessary to keep the space above the liquid as free from vapor as possible; this may be done by condensing the vapor (distillation) by removing it with a pump, or by means of a current of air or other gas. Among the many examples which might be given it will suffice to mention the drying of clothes. It is well known that, other things being equal, they dry much more quickly on a windy day than when it is quite calm. The most important technical application of evaporation is in the production of steam not only for engines but also as a means of distributing heat, one advantage of its use being that the temperature can be regulated so that stirring is unnecessary and overheating (charring) is impossible. The domestic 'double boiler' is an example of this. The industries using evaporation are far too numerous to mention, but reference may be made to the manufacture of sulphuric acid and sugar, the preparation of salt from brine and the recovery of sodium hydroxide in paper-making (q.v.). In nature evaporation plays a most important part. Wherever water is exposed it vaporizes. The quantity of water vapor which can remain in air depends, as mentioned above, on the temperature, if this falls below the point of saturation the excess of water will be deposited as mist, dew, rain, snow, etc., depending on the temperature. 'White frost' is simply frozen dew. In this manner water is being constantly taken from the ocean, carried to the land, deposited as rain, etc., finally returning to the ocean carrying part of the land dissolved and suspended in it. (See WATER). The heat energy required is, of course, supplied by the sun. Evaporation from land is most rapid when the latter is destitute of vegetation, living or dead. Hence, the importance of forests in regulating evaporation and also rainfall.

EVARTS, *ĕv'arts*, JEREMIAH: 1781, Feb. 3—1831, May 10; b. Sunderland, Vt.: religious editor and promoter of Christian missions. He graduated at Yale 1802, taught school, studied law, was admitted to the bar 1806, and practiced in New Haven four years. He then became editor of the *Panoplist*, a religious (Cong). periodical of Boston, treas. of the A. B. C. F. M. 1812, editor of the *Missionary Herald*, which succeeded the *Panoplist* 1820, and sec. of the A. B. C. F. M. 1821, retaining the latter office till death. Among his publications were numerous essays in defense of the rights of the Indians. He was father of William Maxwell Evarts.

EVARTS, WILLIAM MAXWELL, LL.D: lawyer and statesman: b. Boston, 1818, Feb. 6; d. 1901, Feb. 29; son of Jeremiah Evarts. He took a preparatory course at the Boston Latin School, graduated at Yale 1837, studied

law at the Harvard Law School and with Daniel Lord in New York, was admitted to the bar 1841, and rapidly attained distinction. In 1849, Apr. he was appointed deputy U. S. dist. attor. for the New York city district, and held the office for four years. He acted as dist. attor. during the illness of the incumbent 1851, and successfully conducted the prosecution of the persons engaged in the Cuban filibustering scheme known as the 'Cleopatra expedition,' Apr., and the same year made an argument in favor of the constitutionality of the Metropolitan Police Act. In 1853 he resumed private practice, and as counsel for the state of N. Y. gained wide reputation by his conduct of the celebrated Lemmon slave case before the supreme court and the court of appeals. He became a republican soon after the organization of that party; was a candidate with Horace Greeley before the republican caucus for U. S. senator, when Ira Harris was chosen 1861; was leading counsel employed by President Johnson when impeached by the house of representatives 1868, Apr.–May; was attor.gen. of the United States under President Johnson 1868, July—1869, Mar. 4; and was appointed by President Grant counsel of the United States before the tribunal of arbitration at Geneva to settle the 'Alabama' claims 1872. To his clear and unanswerable presentation of the disputed claims of American citizens was due, in great measure, the decision in favor of the United States. In 1875 he was senior counsel of Henry Ward Beecher in the suit brought against him by Theodore Tilton in Brooklyn; 1877, the republican advocate before the electoral commission; 1877–81 sec. of state of the United States; 1881 United States delegate to the international monetary conference in Paris; and 1885, Jan. 21, was elected U. S. senator from N. Y. for the term ending 1891, Mar. 3. He was conceded to be one of the most eloquent advocates in the United States; was engaged in some of the most celebrated trials of his day, and for many years was employed in cases in which large corporations were parties or interested. He was well known also as a public orator, and delivered memorable addresses in eulogy on Chief-Justice S. P. Chase at Dartmouth College 1873, June 25; on the 100th anniversary of American independence at Philadelphia 1876, July 4; at the unveiling of the statues of William H. Seward and Daniel Webster in New York; and at the dedication of the Bartholdi Statue of Liberty, 1886, Oct. 28. He received the degree LL.D. from Union College 1857, Yale Univ. 1865, and Harvard Univ. 1870.

EVASION, n. *é-vā′zhŭn* [F. *évasion*—from L. *evasĭōnem*—from L. *evāsŭs*, gone out or forth—from *e*, out of; *vāsus*, gone or entered (see EVADE)]: the act of avoiding or eluding—applied particularly to speech; a shift; a subterfuge. EVA′SIVE, a. *-sĭv*, using artifice to escape or avoid; shuffling. EVA′SIVELY, ad. *-lĭ*. EVA′SIVENESS, n. *-nĕs*, the state or quality of being evasive.—SYN. of 'evasion': prevarication: equivocation; shuffling; eluding.

EVE, n. *ēv* [Heb. *chavah,* Eve, literally meaning life]: wife of Adam, the first man; the mother of all living: see ADAM AND EVE.

EVE, n. *ēv,* or EVEN, n. *ē′vn* [contr. for EVENING, which see: AS. *æfen;* Icel. *aptan;* Ger. *abend*]: the close of the day; the night before a holy-day, as Christmas *eve;* time immediately preceding any important event.

EVECTICS, n. *ē-vĕk′tĭks:* in *old med.,* that branch of medical science which treats of the method of acquiring a good habit of body.

EVECTION, n. *ē-vĕk′shŭn* [L. *evĕctĭōnem,* a carrying out]: in *astron.,* an inequality of the moon's motion in its orbit, resulting from the combined effect of the irregularity of the motion of the perigee, and alternate increase and decrease of the eccentricity of the moon's orbit: see LUNAR THEORY.

EVELYN, *ĕv′ė-lĭn,* JOHN: 1620, Oct. 31—1706, Feb. 27; b. Wotton, seat of the Evelyn family, in Surrey. He was educated at the free school of Lewes, and at Balliol College, Oxford. In 1640, he entered the Middle Temple, and in the following year, prompted by the ominous appearance of public affairs, and after having witnessed the trial of Strafford, he set out for the continent, returning, however, in the autumn. In 1642, upon offering his services to Charles I., he was accepted as a volunteer in Prince Rupert's troop, but 1643 he again went to the continent, where he mainly lived for eight years. After 1652 he settled in England, where he lived studiously and in private till the Restoration, after which he was much employed by the government. On the organization of the Royal Soc., he became one of the first members, and was an industrious contributor to its Transactions. He succeeded 1699 to the family estate at Wotton, and there, after a long studious, and highly useful life, he died.

His principal works are—*Sculptura, or the History and Art of Chalcography and Engraving on Copper,* 1662; *Silva, or a Discourse of Forest Trees, etc.,* 1664; and his *Memoirs* (published 1818), to which Evelyn owes celebrity. They are in the form of a diary, and continued during a period of about 70 years—and these the most dramatic in the recent history of England. They are of inestimable value.

EVEMERUS, or EUHEMERUS: see EUHEMERISM.

EVEN, a. *ē′vn* [Ger. *eben;* Dut. *even;* Icel. *jafn,* equal, plain: L. *æquus,* even]: having a flat or smooth surface; level; not rough; equal; calm; not easily disturbed; balanced or settled; not odd, as a number divisible by two: AD. or CONJ. in like manner or degree; precisely the same; at the very time; so much as; denoting an increase, addition, or slight exaggeration; denoting emphasis, as, 'I, even I': V. to level; to lay smooth; to place in an equal state. EVENING, imp. *ē′vn-ĭng.* EVENED, pp. *ēv′nd.* EVENLY, ad. *ē′vn-lĭ.* E′VENNESS, n. state of being

level or smooth. EVENHANDED, impartial; just. EVEN-KEEL, said of a ship having the same draught of water fore and aft.

EVEN, n. *ē'vn:* for EVENING, which see. EVEN-SONG [AS. *æfen-sang*, vespers (see EVE)]: vespers; in the *Book of Common Prayer*, evening service as distinguished from 'Matins' or morning service—referring to the time when intoning the service was nearly universal. EVEN'TIDE [AS. *tīd*, time, season]: the evening.

EVENING, n. *ē'vn-ĭng* [Dut. *avend;* Ger. *abend*, the sinking of the day: Swiss, *aben*, to fall off—from Ger. *ab*, off, away]: the close or last part of the day; the beginning of the night or darkness; the decline or latter part of life: ADJ. relating to or at the close of the day.

E'VENING PRIMROSE: See ŒNOTHERA.

E'VENING SCHOOLS: helps toward popular education. They either take the form of lectures or lessons, carrying further the education received at school; or they aim to supplement defective early training, or, it may be, to give the simplest rudiments of elementary instruction to adults under the disadvantage of being pupils for the first time in their lives. The former are found chiefly in connection with mechanics' institutes, now very numerous in Great Britain, and extending in the cities and large towns of the United States—a most important educational agency; or with existing day schools, and congregational organizations; while the latter more frequently fall under the head of parochial missionary work, or are connected with factories. These latter constitute the class of evening schools which now engage most interest and which present the greatest difficulties in working.

The first evening school proper, in Britain, for boys and girls who had to work all day for a livelihood, was founded in Bristol, Eng., 1806. Bp. Hinds was the first *publicly* to suggest (1839) that evening schools fairly come within the sphere of state action in Great Britain. The recent inquiries have brought out that the majority of those who frequent existing evening schools have never received any elementary instruction, or have forgotten what they once knew, and that a large proportion are either adults or adolescent young men and women. They attend for the purpose of learning to read, write, and cipher. Though in many instances, especially where no fee is charged, the irregularity and unpunctuality of the attendance are great, yet in the majority of cases there is an earnest desire on the part of the pupils to benefit by the instruction. It is a question of some national importance how far schools of this supplementary class should be left to private philanthropy. It is a question also, to some extent implied in the other, whether the peculiarly delicate work required in evening schools is not more efficiently discharged by voluntary than by paid laborers.

EVENING SCHOOLS.

Subjects and Method.—As to subjects to be taught, that class of evening schools which continue the work of the day school, should include in their scheme of practical instruction the elements of those sciences which bear most directly on life, such as social economy and the laws of health. Evening schools of the humbler and more urgent sort will necessarily confine themselves to reading, writng, and arithmetic. The short period of attendance requires that *much* be done rather than *many things*. Through a well-constructed course of reading-books for adults, all the general culture and specific information attainable will best be given. See EDUCATION, NATIONAL OR STATE, etc.

In other countries of Europe, evening schools, where they exist, have in view mainly the continuance of the education received in primary schools. In France, however, the wants of untaught adults have been provided for by the establishment by law of evening schools suited to them. In all the states of Germany, provision is made more or less in the country districts, and always in the the large towns, for continuing the instruction given in the primary schools Schools for those who wish to learn reading and writing for the first time seem scarcely to exist, probably because not needed. The schools which do exist have an affinity to mechanics' institutes. The instruction is given on Sundays and holidays, and in many places also on one or two evenings in the week. But Sunday instruction alone seems to have been originally contemplated. See SUNDAY SCHOOLS. The subjects taught are the ordinary branches, with geography, free-hand and geometrical drawing, geometry, and in some cases the elements of natural science and the laws of health. These institutions are supported by the funds of the commune or district; in some cases supplemented by the state.

In the United States, with few exceptions, the establishment and maintenance of evening schools are directed by the public school officers of the co., city, town, or village. The state school laws of Mass. provide that towns having free public schools may keep them open day or evening, and that every town and city having 10,000 or more inhabitants must maintain evening schools in addition to their regular day-schools. It is provided in Ohio that in any district composed in whole or in part of a city or village the board of education or school trustees may establish a suitable number of evening schools. Elesewhere, and particularly in large or distinctly manufacturing cities and towns, local educational authorities establish evening schools during the winter months, in which either a general or a technical curriculum is followed, for the benefit of persons, old or young, who cannot avail themselves of the regular facilities during the hours of labor. The first evening schools were established by private benevolence, and many noted ones are still so sustained. The Cooper Union (q.v.) for the Advance-

ment of Science and Art in New York, with its free night schools of stenography, typewriting, and telegraphy; its school of science in technical branches; and its school of art is of this character. Evening schools in general are in the immediate charge of as many principals of the day schools as are required, and while some ambitious day school teachers also take evening school classes, it is far more common to select subordinate teachers for evening school from the list of approved candidates for classes in the day schools and the pupils of the co. or city normal schools. The popularity of evening school is increasing rapidly in the thickly settled portions of the country, and their statistics must soon form an interesting feature of public educational reports.

EVENT, n. *ĕ-vĕnt′* [L. *eventus*, come to pass, happened —from *e*, out of; *vĕnĭō*, I come]: that which happens or comes to pass; any incident, good or bad; the conclusion; the result. EVENT′FUL, a. *-ful*, producing great changes; full of events. EVENT′UAL, a. *-ū-al* [F. *éventuel*]: happening as a consequence; coming as a result; final; contingent. EVENT′UAL′ITY, n. *-ăl′ĭ-tĭ*, the coming or happening as a consequence; contingency; dependence upon an uncertain event; an organ in phrenology, said to enable one to note and compare all the active occurrences of life. EVENT′UALLY, ad. *-lĭ*. EVENTUATE, v. *ĕ-vĕnt′ū-āt*, to come out as a result; to come to an end. EVENT′UATING, imp. EVENT′UATED, pp.—SYN. of 'event': circumstance; incident; adventure; issue; occurrence; termination; consequence; end

EVENTRATION, n. *ē-vĕn-trā′shŭn* [F. *eventrer*—from L. *e*. out; *venter*, the belly]: in *surg.*, a tumor produced by the relaxation of the abdominal wall: also a large wound in the abdomen through which the intestines protrude.

EVER, ad. *ĕv′ėr* [AS. *æfre*, ever; Goth. *aivs*, long time: Dut. *eeuw;* L. *ævum;* Gr. *aiōn*, an age]: at any time; always; in any degree; contr. into E′ER, *ār*. EVER AND ANON, frequently repeated. EVER SO LONG, a very great time. (*Note:* the logical form is NEVER SO LONG). FOR EVER, unendingly. FOR EVER AND EVER, duration without end. EVERLAST′ING, a. *-lăst-ĭng*, lasting for ever; perpetual: N. never-ending duration; the Deity, without beginning or end. EV′ERLAST′INGLY, ad. *-lĭ*. EVERLAST′INGNESS, n. EV′ERGREEN, n. a plant or tree that retains its greenness throughout the year. EV′ERMORE′, ad. *-mōr′*, unendingly; always. EVERLASTING FLOWERS, flowers which when plucked and dried retain their color for a long time. EVER A or E′ER A, in *OE.*, any. *Note.*—EVER, as part of a word, denotes without intermission. EVERLASTING, that which has no end. ETERNAL, that which has neither beginning nor end.—SYN. of 'everlasting, a.': endless; interminable; unceasing; continual; uninterrupted; incessant; unintermitted; immortal; eternal; infinite; for ever.

EVEREST, *ĕv'ėr-ĕst,* Mount: highest known point on the earth: peak of the e. range of the Himalaya Mountains in n. Nepaul; n.e. of Khatmands, between the peaks of Dhawalaghiri and Kunchain-Junga; lat. 27° 9′ 16″ n., long. 85° 58′ 8″ e.; height above sea level as measured 1856 by Waugh, 29,002 feet.

EVERETT, *ēv'er-ĕt:* city of Middlesex co., Mass., on the Eastern R. R., 3 m. n. of Boston, with which it is connected by a street railroad. It was incorporated a city, 1893; is lighted by gas, receives its supply of water from Mystic waterworks of Boston; has several churches, a young ladies' institute and several pub. schools, baby-carriage, chemical, phosphate and rope factories. Pop. (1900) 24,336; (1910) 33,484.

EVERETT, *ĕv'ėr-ėt,* Alexander Hill: 1792, Mar. 19—1847, June 28; b. Boston: diplomatist and author. He entered Harvard College 1802, and graduated 1806, though the youngest of the *alumni,* with the highest honors. After practicing as a lawyer, he was appointed U. S. ambassador at the Hague 1818; and went in the same capacity to Spain 1825. Four years afterward he returned to the United States, and became proprietor and editor of *The North American Review* (1830–35), and was in the legislature of Massachusetts. In the winter of 1840, he resided in Cuba, as a confidential agent of the United States govt. He sailed for China as minister-plenipotentiary 1845, and died at Canton. Everett was a man of great versatility of talent and of extensive erudition. Politics and belles-lettres, political economy and poetry, statistics and æsthetics, alternately engaged his thoughts and pen. His writings are—*Europe, or a General Survey of the Political Situation of the Principal Powers,* etc. (London and Boston, 1822); *New Ideas on Population,* etc. (London and Boston, 1822); *America, or a General Survey of the Political Situation of the Several Powers of the Western Continent,* etc. (Phila. 1827), in which he labors to show that Russia and the United States must in the long-run share the continent between them; *Critical and Miscellaneous Essays* (two series Boston 1845 and 47.) These are on a vast variety of subjects, and are probably the most interesting productions of his pen. He published a vol. of poems 1845.

EVERETT, Charles Carroll, American clergyman and educator: b. Brunswick, Me., 1829; graduated from Bowdoin College in 1850; studied at Harvard and Berlin universities; became professor of theology at Harvard Divinity School in 1859, and dean in 1878, and died at Cambridge, Mass., in 1900. His principal work, *The Science of Thought,* is a system of logic of the Hegelian type.

EVERETT, Edward, ll.d., d.c.l.: 1794, Apr. 11—1865, Jan. 15; b. Boston: orator and statesman. He studied in the public schools, where he twice won the

Franklin medal, and at Exeter Acad., graduated at Harvard Univ. with high honors when a little more than 17 years old (1811), was appointed tutor of Latin at Harvard, studied theology, and was ordained pastor of the Brattle Street (Unit.) Church, Boston, 1814, Feb. 9. In 1815, Mar., he was chosen Eliot prof. of Greek literature at Harvard Univ., and resigning his pastorate, went to Europe, studied at the Univ. of Göttingen two years, and spent two years in travel and special study in Greece. Returning 1819, he entered upon his duties as prof., and held the chair till 1825. He delivered a sermon in the hall of the house of representatives, Washington, 1820, which was pronounced a masterpiece of pulpit eloquence; an oration (Phi Beta Kappa) at Cambridge before a distinguished audience, that included Gen. Lafayette, 1824, Aug.; and one on Forefathers' Day at Plymouth in Dec. following. In 1824 he was elected member of congress from the Middlesex dist.; resigned his professorship the following year; served in congress by re-elections till 1835, when he was elected gov. of Mass.; was re-elected three times, and defeated the fourth year by one vote out of over 100,000. In 1840 he established himself in Florence, Italy, for the purpose of writing history, but within a few months was summoned to London to enter upon the duties of U. S. minister, to which he had been appointed through the influence of Daniel Webster and without his own knowledge. After four years of diplomatic service in England, he returned to the United States, again promising himself a period of leisure to undertake his projected historical work, and again meeting disappointment, as he was immediately elected to the vacant presidency of Harvard Univ., which office he held 1846–49. He then sought retirement in his own choice library in Boston, where he was undisturbed by calls to public duty till 1852, Nov., when upon the death of Daniel Webster, then U. S. sec. of state, he was appointed by Pres. Fillmore to the vacant office. He served to the close of that administration, was then elected U. S. senator by the Mass. legislature to succeed John Davis, resigning after one year because of ill health. In 1860 he was a candidate for the vice-presidency of the United States on the ticket with John Bell, of Tenn., but failed of election. The latter years of his life were passed in lecturing and literary work, his last public utterance being an oration on *The Relief of Savannah*, in Faneuil Hall, Boston, six days before his death. He delivered his oration on the *Character of Washington* for the benefit of the Mount Vernon fund 122 times, and turned over $60,000 as the net proceeds; an address on *Charitable Institutions and Charity* for the Boston Provident Assoc. 15 times, netting $13,500; and one on the *Early Days of Franklin* for several institutions 5 times, netting $4,000. He published four vols. of *Orations and Addresses* (1836, 50, 59), beside numerous special works. While U. S. minister to England, he received the degree D.C.L., from Oxford, and LL.D., from

Cambridge and Dublin Universities, and was elected a member of the French Institute. As an orator he was elaborately finished and elegant in composition and delivery.

EVERGLADES, THE: the State of Florida is one immense mountain top of limestone formation, covered with a network of pot-holes, varying in size from a few feet to thousands of acres; it has countless lakes of fresh water, fed by springs and subterranean streams, and among these is Lake Okeechobee, named by the Indians, Lake Mayaimi, and now known as the Everglades, an irregular body of water 130 miles north and south, and 70 miles east and west, the altitude of its rim being 12 feet above mean low tide. Over the rocky bottom of this lake lies a layer of muck, formed of alluvial deposit and decayed vegetation, varying in thickness from a few inches to several feet, and in this muck the saw-grass, tough as bamboo, its edges sharp and jagged as a saw, flourishes, sometimes growing to a height of 10 feet. Toward the western end of the lake the saw-grass is interwoven with wild myrtle and forms an almost impassable barrier, running through the entire length of the lake, although there are some passages through it, known familiarly to the native Seminole Indians, but which are almost impossible to locate by the explorer.

Scattered along the eastern and western edges of the lake are numerous islands, some very small, others hundreds of acres in extent, covered with luxuriant growths of live oaks and bays, interspersed with wild cucumber, lemon, and orange trees. The papaya, the custard-apple, and prickly-ash are of frequent occurrence, and here and there may be seen the cabbage palmetto, the pine, and the rubber-tree.

The first white man to enter this mysterious, silent country was a Spaniard, one Escalente de Fontenada, who, after being shipwrecked in the Strait of Florida, was made captive and slave by the great cacique, Calos. However, he left only a few meagre details of his experiences during his 17 years of captivity. Frequent expeditions of exploration have been sent out by the United States government to penetrate this wilderness if possible, but all have failed, each bringing the explorers, after days of privations, to the conclusion that the Everglades, though fascinating in its wildness, is a region to be avoided, the forest being impenetrable and practically valueless; and the lake a mixture of currents which seem to begin without reason and lead nowhere in particular.

Animal life in the Everglades is fairly abundant, deer being found on both eastern and western shores, otter are plentiful, alligators and crocodiles quite numerous, while the snake is there in large numbers. The Glades were once the breeding place for the egret, the ibis, and the heron, and, while many of them are yet to be found, the plume hunter has made such inroads that all are nearly extinct. The region is almost free of all insects,

the constantly moving water affording no breeding-place for insect life, though at certain seasons of the year the waters contain an annoying bug called the 'alligator flea.' Fish abound in the fresh waters, and the terrapin and a flat, soft-shell turtle are quite plentiful.

The title to the Everglades is vested in trustees of the Internal Improvement Fund of Florida by act of Congress of 1850, and they are making efforts to drain the Glades and open it to actual settlers, the cost of reclamation being small compared to the great agricultural value, for once dried it would open up the best sugar lands in the South. (See also SEMINOLE).

EVERGREENS: trees and shrubs which retain their foliage and remain fresh and green through the winter. The leaves are usually thicker and firmer than those of deciduous trees, while the breathing-pores, or *Stomata* (q.v.), are less in number and appear only on the under surface. In some species, as the fir, the leaves are small and narrow; in others, as the rhododendron, they are large and broad. In most species of evergreens the leaves fall in the spring when new ones are formed, but the change is effected so gradually that the branches are never bare. Nearly all the *Coniferæ* are evergreens. Though growing readily in widely differing climates they largely prevail in northern latitudes, where dense forests of pines, firs, and kindred species are common. They are extremely hardy, and resist the destructive action of frost better than the deciduous trees of cold climates. Certain species, as the pine, thrive best on dry ground, and it is claimed by some that they strongly tend to desiccate the soil. It is not probable that this is the case, though there is no doubt that in winter they exhale moisture in somewhat greater degree than deciduous trees.

Some of the most magnificent evergreens in the world are in the w. part of the United States. The great California tree (*Sequoia gigantea*) reaches a diameter of 20 to 35 ft., and a height of nearly 300 ft. Evergreens of moderate size are found in vast numbers in the wooded portions of the country, and some of the species, as the pine, spruce, and cedar, are among the finest timber trees. Evergreens are also planted largely for ornamental purposes. Among the best varieties are the Norway Spruce, Scotch Pine, Austrian Black Pine, White Pine, Hemlock, Red Cedar, and Arbor Vitæ. Evergreens should be planted when the first bright new leaves appear (in the Northern States in May or June), because then the sap is thin and less likely to thicken fatally into gum in the process of transplanting. Care is needed to keep the roots from drying in that process, which must be followed by mulching. Sometimes, but rarely, evergreens succeed on prairies as screens for orchards. For this purpose the Norway Spruce, Hemlock, and Fir have proved of great value. If only a single row of trees is put out, they should be planted not more than eight ft. apart. A double row, with the trees 16 ft. apart,

though requiring more land, will be much more efficient. Evergreens are uesd to quite an extent also for fencing purposes, but are gradually losing popularity for this use. The Arbor Vitæ is quite hardy, thrives in a great variety of soils and climates, and forms a beautiful and useful hedge. At the holiday season small evergreens are in great demand for Christmas trees, and branches are freely used in the interior decoration of public and private buildings.

EVERLAST'ING FLOWER: popular name of certain plants, the flowers of which suffer little change of appearance in drying, and may be kept for years without much diminution of beauty. They are of the order *Compositæ*, having their flowers (heads of flowers) surrounded with an involucre; the scales of which resemble the petals of a corolla, but are rigid, membranous, and contain little moisture. Some species of cudweed (q.v.) (*Gnaphalium*) are often called everlasting flowers, and the other plants which bear the name belong to nearly allied genera, but particularly to the genus *Helichrysum*, which contains a great number of species, natives mostly of Africa. *H. arenarium* is frequent on dry sandy soils in many parts of Europe and central latitudes of Asia. It is covered with a gray felted down, and has yellow flowers, which, when rubbed, emit a faint aromatic odor. *H. angustifolium* and *H. Stœchas*—shrubby species, natives of the s. of Europe—have larger yellow flowers. Some species have a powerful and pleasant aromatic odor. In France these flowers are called *Immortelles*, and often woven into circular wreaths, and placed beside recent graves, as emblems of immortality.

EVERNIA, n. *ē-vėr'nĭ-a* [Gr. *euernēs*, sprouting, flourishing; *eu*, well; *ernos*, a young sprout, shoot, or scion]: in *bot.*, a genus of lichens, order *Parmeliaceæ*. *Evernia prunastri* is common on trees, but does not often produce fruit. It is said to be an astringent and a febrifuge. It can also be used for dyeing. Formerly it was ground down with starch to make hair-powder, and it has been used as a substitute for gum in calico printing. EVERNIC, a. *ē-vėr'nĭk*, belonging to or in any way connected with the genus *Evernia*.

EVERSION, n. *ē-vėr'shŭn* [F. *éversion*—from L. *ēversĭōnem*, a turning out or expulsion—from *e*, out; *versus*, turned]: the protrusion of organs from a cavity; the state of being turned back or outward.

EVERSLEY, *ėv'ėrz-lĭ*, VISCOUNT (CHARLES SHAW LEFEVRE): 1794, Feb. 27—1888, Dec. 28: parliamentarian, descended maternally from the Lefevres, who came to England from Rouen on the revocation of the Edict of Nantes. He was educated at Winchester and Trinity College, Cambridge, called to the bar at Lincoln's Inn 1819, entered parliament 1830 as member for Downton, and represented Hants 1831–57. In 1839 he was chosen speaker of the house of commons; and re-elected in the parliaments

of 1841, 47, and 52. He retired from the office 1857, with a peerage and a pension of £4,000 a year. During the 18 years of his speakership, he suggested and carried out many improvements in the forms and procedure of the lower house, tending to the dispatch of business. He was dignified in person, affable and accessible to the younger members, and profoundly versed in the laws of debate and parliamentary practice.

EVERT, v. *ĕ-vėrt'* [L. *e; verto,* I turn]: to destroy; to overthrow; in *med.* and *bot.,* to turn outward.

EVERY, a. *ĕv'ėr-ĭ* [AS. *æfre,* ever; *ælc,* each: OE. *ever-ælc,* every]: the whole, taken one at a time; each one of a whole. Ev'ERYDAY, a. common; usual. EVERYTHING, n. all without exception. Ev'ERYWHERE, ad. *-hwėr* [*ever,* and AS. *gehwær,* on every side]: in all places. EVERY NOW AND THEN, at short intervals; frequently.

EVESDROPPER, n. *ēvz'drŏp'pėr* [AS. *efese*]: See EAVESDROPPER.

EVESHAM, *ēvz'am* or *ēvz'ham,* originally EOVESHAM: municipal borough in the s.e. of Worcestershire, England, on the right bank of the navigable Avon, 15 m. s.e. of Worcester. It has a fine modern bridge, and a belfry which dates from 1533. Public gardens and water-works have recently been added. Evesham lies in a beautiful and fertile vale, and market-gardening is the chief industry. It has some manufactures of agricultural implements. Simon de Montfort was defeated at Evesham 1265.—Pop. 5,112.

EVICT, v. *ĕ-vĭkt'* [L. *evictus,* conquered completely—from *e,* out of; *vinco,* I conquer]: to dispossess of lands or tenements by legal proceedings, as a tenant by a landlord; to recover land, etc., by legal process. EVIC'TING, imp. EVIC'TED, pp. EVIC'TION, n. *-vĭk'shŭn* [F.—L.]: the recovery of lands or tenements from another's possession by legal proceedings, in virtue of a preferable title. Eviction from land alone is sometimes called Ouster. See BALFOUR, ARTHUR JAMES; DAVITT, MICHAEL; GLADSTONE, WILLIAM EWART; HOME RULE, in Ireland; LAND LEAGUE, IRISH; PARNELL, CHARLES STEWART.

EVIDENCE, n. *ĕv'ĭ-dĕns* [F. *évidence*—from L. *evĭden'-æm,* plain, distinct—from *e,* out of; *vĭdĕō,* I see—*lit.,* state of being plain and distinct]: a witness; that which enables the mind to see truth; proof; testimony; certainty; V. to prove; to show; to make clear to the mind. EVIDENCER, *-sėr,* witness, one who gives evidence. Ev'IDENCING, imp. Ev'IDENCED, pp. *-dĕnst.* Ev'IDENT, a. *-dĕnt* [F.—L.]: plain; clear; obvious; open to be seen. Ev'IDENTLY, ad. *-lĭ,* plainly; notoriously. Ev'IDEN'TIAL, a. *-dĕn'shăl,* clearly proving. EVIDIBLE, a. *ĕv'ĭ-dĭ-bl,* capable of bearing evidence.—SYN. of 'evident': manifest; apparent; notorious; visible; conspicuous.

EVIDENCE, in Law: the means by which matters of fact may be proved or disproved. Evidence may be

either oral, i.e., consist of the statements of witnesses given in court, or documentary, i.e., made up of writings of various kinds. The weight to be attached to any particular evidence is a question entirely within the province of the jury; but whether such evidence is competent or admissible to prove or disprove the issue under consideration, is for the judge to determine.

Since proof amounting to the certainty of demonstration is available only in abstract science, and does not exist in the common relations of mankind, a standard short of demonstration, yet sufficient to convince the mind, must be applied to the settlement of disputes in courts of law. The burden of proving a fact is always upon the party asserting or seeking to maintain the affirmative. Such a fact is sufficiently proved, in a civil case, by a preponderance of evidence, but in a criminal trial, in order to convict, the jury must be satisfied beyond a reasonable doubt, that the prisoner committed the offense with which he stands charged. Certain things are said to be 'judicially taken notice of' in courts of law, which simply means that their existence is assumed without any proof in the particular case. Instances are—the public acts of sovereign states, the meaning of ordinary words and abbreviations, the well known and commonly observed phenomena of nature, the divisions of time universally recognized, and the like. Evidence is spoken of as *direct* or as *circumstantial.* Direct evidence is that of witnesses deposing of their own personal knowledge to facts, while circumstantial evidence is the inference drawn from facts proved. Attempts have been made to throw discredit upon circumstantial evidence, but properly regulated by the abundant tests and safeguards which the law places around this method of proof, it becomes as effective as direct evidence for the discovery of truth. Sometimes it is even more convincing.

Presumptive evidence, or evidence assumed by the court to exist on a given state of facts being proved, is founded upon presumptions of law and presumptions of fact. Presumptions of law are again divisible into conclusive and disputable presumptions. In conclusive presumptions, no evidence is permitted to be received to rebut the inference, which the law, for reasons of expediency, says shall be drawn in such cases. In disputable presumptions, however, evidence may be received to rebut the influence, which otherwise would be drawn. Evidence, to be legally receivable in a court of justice, must be relevant; that is to say, it must be so connected with the issue in dispute as directly to prove, or have a tendency to prove, that particular issue, and it must be the best evidence which can, under the circumstances be procured. Witnesses are permitted to testify only as to such facts as are within their own knowledge. Statements communicated to a witness by a third party, whether spoken or wrtiten, are called 'hearsay,' and unless under the circumstances such statements can be shown

to be original evidence, they cannot be received. To this rule, however, there are exceptions, founded upon the difficulty or impossibility of procuring better evidence in the excepted cases. The testimony of *interested* witnesses, formerly not admissible, is now received and estimated at its value in view of their interest in the case. Charles J. McCurdy of Conn. secured this change in that state abt. 1848; N. Y. followed; then the other states. In 1851, Mr. McCurdy visited England, and his presentation of the question wrought a change in the law there, also, which has often been incorrectly attributed to Lord Denman. Certain kinds of evidence are not received in courts on the ground that the interests of society require them to be excluded. Such are the testimony of husband and wife in certain cases, and professional communications made to a lawyer. Although not so at common law, by statute in many of the American states, confessions to a minister of religion, and information imparted to a physician in the course of professional treatment, cannot be revealed upon the witness stand. This restraint of secrecy is placed also upon the doings of grand jurors, judges, and state officials. The method of procuring the attendance of witnesses, if within the jurisdiction of the court, is by subpœna. If beyond the jurisdiction of the court, or within its jurisdiction, but unable to attend personally, the method of procuring the witness' testimony is by commission or deposition respectively. As a rule, a witness in a civil case is entitled to a fee for attending and for his travelling exepnses, varying in the different states. In criminal cases, a witness is usually required to attend without fee. The practice in swearing witnesses is to have the witness lay his hand upon and kiss the volume containing the gospels, but a witness may be sworn in any manner obligatory upon his conscience. In some of the American states, a simple affirmation on the part of the witness is deemed sufficient. A witness is not bound to answer where such answer will expose him to a forfeiture of his property, or to a criminal penalty, nor is any inference permitted to be drawn prejudicial to the witness from such refusal to answer. But if the answer merely exposes the witness to a civil action, or pecuniary loss, or has a tendency to degrade his character, he is not excused from answering. The principles applicable to the admissibility and competency of evidence are usually the same in civil as in criminal trials. But in criminal trials two very important facts must be proved. These are the *corpus delicti*, and the identity of the prisoner. By the *corpus delicti* is meant the body of the offense. Thus, if a murder or robbery is charged, a murder or robbery must first be proved. A neglect to insist upon a strict adherence to this rule might result in a conviction of a person of murder, while the person supposed to be murdered might still be living. The proof of the identity of the prisoner also is fundamental. See OATH; JURY; WITNESS; DEED; TESTING; etc. See also works on

evidence (American), Greenleaf; (English) Taylor; (Scotch) Dickson.

EVIDENCES OF CHRISTIANITY: See CHRISTIANITY.

EVIL, a. *ē′vl* [Ger. *übel;* Goth. *ubils;* Dut. *evel* and *euvel:* comp. Gael. *aimh*=*āv*, a prefix denoting negation or deprivation]: ill; wicked; vicious; having bad qualities of any kind; injurious; unfortunate; unkind: N. wickedness; misfortune; calamity; the reverse of good; suffering; that which produces pain; any transgression of the moral law; sin. E′VILNESS, n. badness of whatever kind. EVIL-MINDED, possessed of bad dispositions. EVIL-DOER, a wicked person. EVIL-EYE, influence for injury, supposed to be possessed by certain persons who cast an envious or hostile look on any other person or object. EVIL-EYED, *-īd*, having an evil-eye with the power of fascination. EVIL-SPEAKING, slander; calumny. EVIL ONE, Satan. EVILLY, ad. *ē′vl-ĭ*, in an evil manner. EVIL-WORKER, one living in habitual wickedness. KING'S EVIL, scrofula—so named from the former popular belief that it was curable by the touch of royalty (see SCROFULA).—SYN. of 'evil, a.': bad; perverse; wrong; calamitous; mischievous; pernicious; hurtful; destructive; corrupt.

E′VIL: the opposite or negation of good; popularly, either wickedness or calamity; essentially and morally, that which is opposed to the divine order of the universe. A superficial observation shows many apparent exceptions to the prevading harmony and happiness of creation: there are convulsions in the physical world; there are suffering, decay, and death throughout the whole range of organic existence; and the apellation of evil is commonly applied to such phenomena. In the face of the human consciousness, such phenomena appear to be infractions of the general order and good, and it pronounces them *evil.* How far the internal feeling of wrong has been quickened and educated by such outward facts, it is difficult to say, but, beyond doubt, they have exercised upon it a powerful influence. Every form of religion testifies to the recognition of evil in the external world, and superstition in all its shapes rests mainly upon it.

But it is in the sphere of moral life alone that the conception of evil can be said to hold good. After the light of science has explored the secrets of nature, and shown how its apparent anomalies are merely manifestations of a comprehensive harmony, the idea of evil is dispelled from the merely material creation. 'Whatever is, is best,' is seen to be everywhere the law of this creation. There remains, however, the ineradicable feeling of evil in human life and manners and history. There is in the moral consciousness of man a sense of violated order, of transgression of divine law, or what is called *sin*, which is *evil* in its essential form. This fact of evil is everywhere appealed to by the Christian religion; it is the aim of this religion to deliver men from its power and misery. Every

ethical and judicial code is based upon its recognition, and is designed to protect human society from its injurious consequences. It cannot be better or more clearly defined than as a lack of conformity to, or as a transgression of the divine law.

The question of the *origin of evil* has been greatly discussed, and received various answers. The simplest and most direct of these answers is that which maintains a double origin of things, or a system of *dualism*. This conception lies at the bases of many forms of religion; it may be said to be the fundamental conception of all mere nature-religions. Interpreting the obvious appearances of nature, they embody in divine personalities its contending manifestations of light and darkness, benignity and terror. The opposition of Ormuzd and Ahriman in the old Zoroastrian faith is one of the most conspicuous examples of this religious dualism. Manicheism, which spread so widely in the 4th and 5th c., and the Syrian gnosticism from which it sprang, also are historical illustrations of the same principle.

The dualistic theory of the origin of evil, however, could not obviously maintain itself with the advance of speculation and the spread of Christian truth. It was no less clearly a postulate of the cultivated reason than a dictate of divine revelation, that the world proceeded from and is upheld by One absolutely Divine Creator, holy and good, of whom, and through whom, and to whom are all things. It was necessary, therefore to reconcile the appearance of evil with this fundamental admission.

The doctrine of the Fall, especially in the later development which connects it with the existence of a devil or evil spirit, tempting man in the shape of the serpent, was supposed to explain the appearance of evil in human history. Being tempted of the devil, man sinned, and so fell from his obedience to the divine law. This has been known as the orthodox Christian answer to the inquiry, how sin came into the world? And many minds, seeking only the origin of sin in human history, carry the inquiry no further. It is clear, however, that this explanation of the historical origin of evils leaves the question of its ultimate and absolute origin unsettled. The devil being assumed as the cause of man's sin, the further question arises, whence the devil? Is he an absolute personality in which case we are landed in the old theory of dualism? or is he, according to the traditionary Christian conception a fallen angel? in which case the former question returns, whence the spring of evil in him There is no real explanation gained by this removal of the question; it is still the same difficulty—whence the origin of evil in the creation of an all-perfect being, almighty as well as all-wise and good?

Speculation may please itself with ingenious and sometimes instructive answers to this question, but in truth it admits of no satisfactory solution by man's present faculties and with his present knowledge. Some, for example, have argued that evil, like darkness or cold, is an indis-

pensable element of alternation or contrast in human life. All individual reality is only the product of opposite forces working together. Character could arise only from the interaction of opposing ethical influences of good and evil. In nature, we have attraction and repulsion, rest and motion, positive and negative electricity; why should it be different in the sphere of morals Here, too, there must be polarity. Good can exist only in contradistinction to evil; the one no less than the other is necessary to constitute the drama of human life and history. Others, again, have argued, that evil is the result of what is called metaphysical imperfection. God alone can be perfectly good. The creature, in its very nature, is limited, defective; and evil is nothing else than the evidence of this limitation in man. It is not something real or postive, but only a privation. It is in morals what cold and darkness are in physics, a pure negation. Thus have argued such profound thinkers as Augustine and Leibnitz. But it requires little penetration to see that such arguments, however ingenious, and so far well founded, do not meet the essential difficulty of the problem. If evil be, according to such views, a necessary element of human life, in the one case, in order to develop its activity, in the other case, as clinging to its creaturely limitations, then plainly it is not, as regards the whole scheme, *evil*, but is essentially so only in and as concerns the individual who develops it: it is not, and cannot be a contradiction of the true idea of human life, and at the same time a necessary element of it. Whatever necessarily belongs to life, must help its true development, and not injure and destroy it; must be *good*, in short, and not *evil*. Such theories, therefore, solve the problem only by eliminating the fact. The origin of evil must be deemed inscrutable, as being dependent on the free moral agency of personal beings. It is in its ultimate sense conceivable only as a possible quality of free moral action; and moral freedom in man or any created being is one of those ultimate facts which are a profound mystery. It is something which 'we apprehend, but which we can neither comprehend nor communicate.' Evil, in its essential (i.e., moral) sense can be overcome: *good* is more ancient and more strong.

E'VIL EYE: supposed power of inflicting injury by a look. Both in ancient and modern times, the belief that some persons have the power of injuring others by looking upon them, has been widely diffused. The Greeks frequently speak of the *Opthalmos Baskanos* (evil eye), which they conceived specially dangerous to children; and the Romans used the verb *fascinare* to express the same fact. Pliny speaks—not on his own authority, however—of 'those among the Triballians and Illyrians, who with their very eyesight can witch (*effascinent*), yea, and kill those whom they look wistly upon any long time;' and Plutarch states, on the authority of Philaretus, that 'the Thybiens who inhabited Pontus were deadly, not only to babes, but

to men grown, and that whomsoever their eye, speech, or breath would reach, were sure to fall sick, and pine away.' Menalcas, in Virgil (*Ecl.* iii. 102), also complains that some evil eye has fascinated his young lambs—

Nescio quis teneros oculus mihi fascinat agnos.

The principal amulet used by the ancients was the *phallus* or *fascinum*, as the Romans called it, which was hung round the neck of children. Of course, this superstition, like all others, flourished in Europe during the middle ages. See Reginald Scot's *Discovery of Witchcraft;* the *Opusculum de Fascino* of John Lazarus Gutierrez, a Spanish physician, published 1653; and the *Tractatus de Fascinatione* of John Christian Frommann, physician of Saxe-Coburg, 1675. In the British Isles, also, the belief in the power of the evil eye is of old date, and is not dead, at least in Ireland and the Highlands of Scotland. In these countries (as elsewhere), it was once a very common superstition that cattle were subject to injury in this way. Witches had the power to a malignant degree; and various charms, such as twining mountain-ash among the hair of the cow's tail, were used to avert or destroy their noxious influence. In the East, the notion was and is prevalent. The Persians have various methods of discovering the special kind of fascination by which a person is afflicted; and Dallaway, in his *Account of Constantinople* (Lond. 1797), affirms that 'nothing can exceed the superstition of the Turks respecting the evil eye of an enemy or infidel. Passages from the Koran are painted on the outside of the houses, globes of glass are suspended from the ceiling, and a part of the superfluous caparison of their horses is designed to attract attention, and divert a sinister influence.' Hobhouse, in his Travels, bears equally conclusive testimony to the prevalence of this superstition in the Turkish empire, not among Mohammedans only, but among Christians also; while Lane, in his *Modern Egyptians* (1836), gives an account of the precautions taken by the Egyptians to avoid the influence of evil eye. The Amercian Indians partake of the same belief; and it is not improbable that on profound investigation it would be found that every nation that exists or has existed, with anything like a developed system of superstition, believes or has believed in the reality of this fascination in some form or other.

The universality of this superstition goes far to prove that it has what may be called a *natural* origin; and, indeed, as the *eye* is the most expressive organ of the soul or mind of man, through which are shot forth, as it were into the visible world of the senses, the hidden passions, emotions, and desires of the nature, it is not strange that in the 'times of ignorance,' when men could give no rational or scientific account of almost any physiological phenomenon, if connected with psychology, the eye should have been deemed a centre of malignant influence. The eye is, in fact, as potent as superstition dreams: the error lay not in

the recognition of its power, but in explaining the mode of its operation. The person who felt himself under the spell of a powerful gaze, was too agitated to calmly consider the cause of his terrors, and attributed to another results for which mainly he himself was responsible. It was really he that gave to the eye of his fellow-creature its baleful influence; and he quailed less before the force of character which it indicated, than before the fearful fancies with which his own timidity had invested it. See FASCINATION BY SERPENTS.

EVINCE, v. *ĕ-vĭns′* [F. *évincer*—from L. *evincĕrĕ*, to conquer completely—from *e*, out of; *vincō*, I conquer or vanquish: It. *evincere—lit.*, to conquer completely]: to make evident; to prove beyond doubt; to show in a clear manner. EVIN′CING, imp. EVINCED′, pp. *-vĭnst′*. EVIN′CIBLE, a. *-sĭ-bl*, capable of proof; demonstrable. EVIN′CIBLY, ad. *-blĭ*. EVINCE′MENT, n. act of evincing. EVIN′CIVE, a. *-sĭv*, tending to prove.

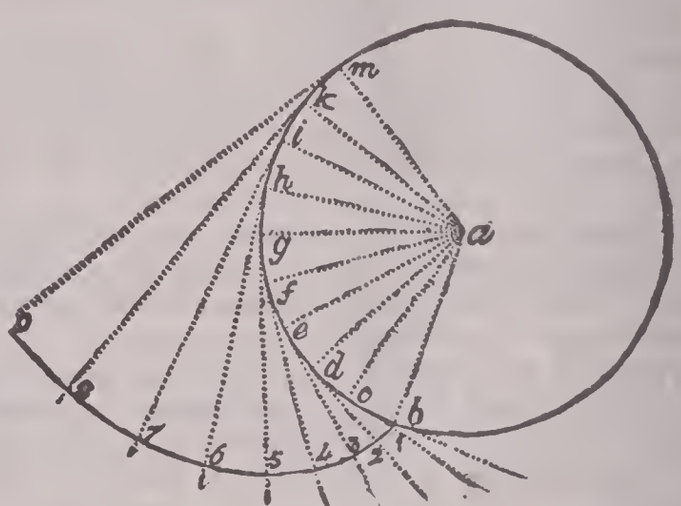
EVISCERATE, v. *ĕ-vĭs′sẽr-āt* [L. *eviscĕrātus*, disembowled—from *e*, out of; *viscĕră*, the bowels]: to take out the bowels or entrails of; to disembowel. EVIS′CERATING, imp. EVIS′CERATED, pp. EVIS′CERA′TION, n. *-ā′shŭn*.

EVITATE, v. *ĕv′ĭ-tāt* [L. *evitātus*, avoided—from *e*, out; *vītō*, I shun]: in *OE.*, to shun; to avoid; to escape. EV′ITATING, imp. EV′ITATED, pp. *-tā-tĕd*. EV′ITA′TION, n. *-tā′shŭn*, act of avoiding.

EVOKE, v. *ĕ-vōk′* [F. *évoquer*—from L. *evŏcārĕ*, to draw forth—from *e; vŏcō*, I call]: to call forth. EVO′KING, imp. EVOKED′, pp. *-vōkt*. EVOCATE, v. *-kāt*, to call out or forth. EVOCATION, n. *ĕv′ō-kā′shŭn* [F.—L]: the act of calling out.

EVOLUTE AND INVOLUTE, in Geometry the evolute of a curve is the locus of its centre of curvature (see CURVATURE, OSCULATING CIRCLE). It is also the envelope (q.v.) of the normals of the curve (the lines perpendicular to the tangents at their points of contact). On drawing a number of normals with some accuracy, the form of the evolute can usually be traced as a curve tangent to all of them. Relative to its evolute, the original curve is called an involute. These names are derived from a remarkable property of the curves. If any two tangents are drawn to the evolute and extended until they meet the involute, the difference between their lengths is equal to the length of the arc of the evolute between their points of contact. If then the evolute be constructed as a raised strip and a string be stretched along its convex side, one end being fastened and the other free, a pencil attached to the free end will trace out the involute as the string, kept constantly stretched, winds off from the evolute. Thus if a curve is symmetric about a vertical line, a pendulum can be made to swing in the curve by hanging it on a flexible string which swings against two checks shaped

in the form of the evolute of the given curve. This principle was applied by Huyghens, who was the first to consider evolutes, to the construction of the cycloidal pendulum, the evolute of a cycloid being the two halves of an equal cycloid. While a curve has only one evolute, each evolute gives rise to an infinite number of involutes obtained in the construction above by attaching the tracing pencil to different points of the string. All the points of the free part of the string have at any instant the same direction of motion, viz., perpendicular to the string, hence, the several involutes produced form a system of *parallel curves*. While evolutes and involutes are easily constructed mechanically, their theory requires the use of the Calculus. From the analytic point of view an involute is generally a much more complicated curve than its evolute. Thus the involute of the circle is a transcendental curve. This involute is roughly constructed



by dividing the circular arc into equal parts at b, c, d,—(See Fig.), and drawing the tangents at each of these points. Then with c as centre and cb as radius describe the arc $b1$ cutting the tangent at c in the point 1; from d as center with radius $d1$ describe the arc 1–2, from e as centre the arc 2–3, and so on. The points 1, 2, 3,—will lie approximately on an involute of the circle.

EVOLUTION AND INVOLUTION, in Arithmetic and Algebra: two operations converse to each other. Evolution is the extraction of roots, involution the raising to powers. When a number a is multiplied by itself the result is called its square and is denoted by a^2. If this is multiplied again by a, the result aaa or a^3 is the cube of a; and so on. In algebra the powers of a binomial $a+b$ are quickly obtained by means of Newton's Binomial Theorem (q.v.), which can also be used in finding the powers of any polynomial. Evolution is indicated by the radical sign $\sqrt{\ }$ or by a fractional exponent: thus $\sqrt{9}$ or $9^{\frac{1}{2}}$ signifies that a number (3) is to be found whose square is 9. If $a^2=b$, a is called the square root of b and indicated by $\sqrt{b}$ or $b^{\frac{1}{2}}$; similarly $\sqrt[3]{b}$ or $b^{\frac{1}{3}}$ indicates the cube

root of b, i.e., that number whose cube is b. The same symbol often indicates both evolution and involution, thus $a^{\frac{2}{3}}$ signifies the square root of the cube of a, e.g., $27^{\frac{2}{3}}=9$. While involution can always be performed exactly, the extraction of roots can usually only be approximately accomplished Thus $\sqrt{2}=1.4142\ldots$, which can be continued to any desired degree of approximation, but never gives a perfectly accurate result. See EXPONENTS: EXTRACTION OF ROOTS.

EVOLVE, v. *ĕ-vŏlv′* [L. *ēvolvĕrĕ*, to roll out or forth—from *e*, out of; *volvo*, I roll]: to open and expand; to disentangle; to develop. EVOL′VING, imp. EVOLVED′, pp. *-vŏlvd*. EVOLVENT, n. *-ĕnt*, in *geom.*, the involute of a curve. EVOLVER, n. *-ėr*, one who or that which evolves. EVOLUTION, n. *ĕv′ō-lō′shŭn* [F.—L.]: the act of unfolding or unrolling; a series of things unfolded arising the one from the other; the gradual descent or development of forms of life from other pre-existing ones; the extraction of roots in *arithmetic* or *algebra*, thus, $\sqrt[3]{125}$ or $125^{\frac{1}{3}}=5$, indicates that the number or root is to be found which, multiplied 3 times by itself, will produce 125—the opposite of *involution*, which see: in *milit.*, movement in order to a change in the arrangement and disposition of a body of soldiers in the field or at a review. All such movements as marching, counter-marching, route-marching, changing front, forming line, facing, wheeling, making column or line, making échelon or square, defiling, deploying, etc., come under the general heading of evolutions: see TACTICS, MILITARY AND NAVAL. Other things being equal, the best evolutions are those which occupy least time and least space. The word evolution applies equally to the movement of ships in a fleet. EVOLUTION THEORY, theory which maintains that the first created animals contained the germs of all future possible successors, successively included one within the other, and that generation is merely the act of unfolding the germ; the theory that every existing form of animal or plant life, even man himself, has been gradually produced or *evolved* during countless ages from one or two monads, or animalcules; the theory that each species of animal is not a special creation, but is gradually produced by the modification of others: see DESCENT OF MAN: DARWINIAN THEORY: SPENCER, HERBERT: CREATIONISM: SPECIES.—EV′OLU′TIONAL, a. *-lō′shŭn-ăl*, connected with evolution. EV′OLU′TIONARY, a. *-ėr-ĭ*, pertaining to evolution. EVOLUTIONISM, n. *-ĭzm*, theory or doctrine of evolution. The term was introduced by Prof. Huxley in his presidential address to the Geological Society 1869. With it he introduced the terms Catastrophism and Uniformitarianism, the three words being designed to discriminate the three chief school of geological thought. EVOLUTIONIST, n. *-ĭst*, one holding the doctrine of evolution, as distinguished from that of uniformity and that of successive catastrophes.

EVOLVULUS, n. *ē-vŏl′vū-lŭs* [L. *evolvo*, I roll out; not twining, as opposed to Convolvulus, which twines]: a genus of *Convolvulaceæ*. It has entire, nearly sessile leaves, and small flowers. About 60 species are known, chiefly from tropical America.

EVORA, *ĕv′o-râ* (ancient *Ebora*): city of Portugal, cap. of the province of Alemtejo, and, after Coimbra, and perhaps Thomar, the most interesting city in the country; beautifully situated on a fertile and elevated plain, 48 m. w.s.w. of Badajoz, about 80 m. e. of Lisbon. It was formerly a place of considerable strength; but its ramparts, and the towers which flanked them, its citadel, its forts, and its watch-towers, are now in hopeless ruin. The town itself is not well built, its streets are narrow and winding, and its houses old and badly planned. It has a cathedral, a large Gothic edifice, founded 1186, the choir of which, rebuilt 1721, is in the Italian style, and is richly adorned with marbles of various colors. Evora has been the see of an archbishop since 1541; has an archiepiscopal library containing more than 50,000 vols.; and several pictures of great merit, attributed to Gran Vasco. It has manufactures of ironware and leather, and a well-attended annual fair. Pop. about 12,000.

Evora is a very ancient city. Quintus Sertorius took it B.C. 30. It was conquered also by the Moors A.D. 712, but retaken from them 1166. The Roman antiquities of Evora are unrivalled in the Peninsula. Among these, the temple of Diana, used as a slaughter-house for some time previous to 1834, exhibits in its fine Corinthian columns admirable proportion and delicacy of sculpture. There is also an aqueduct, 1,200 paces in length, erected by Quintus Sertorius; but the most beautiful Roman relic, and one of the most perfect pieces of ancient architecture extant, is the tower which rises in the city at the extremity of the aqueduct. It is 12ft. 6 inches in diameter, and is surrounded by eight columns of the Ionic order. Ionic pilasters decorate the second story, and the top is crowned with a hemispherical dome. It is wholly of brick, and covered with cement of such a durable nature, that, though this delicate structure has stood since B.C. 70, few parts of it seem impaired by time.

EVOSMIA, n. *ē-vŏs′mĭ-a* [Latinized form of Gr. *euosmos*, sweet-smelling, fragrant; *eu*, well, good; *osmē*, smell]: genus of cinchonads, tribe *Cinchoneæ*, family *Hamelidæ*. It has red flowers and sweet-smelling berries. *Evosmia corymbosa* is poisonous.

EVOVÆ, n. *ē-vō′vā-ē:* in *mus.*, artificial word, consisting of the vowels in *Seculorum Amen*, at the end of the *Gloria Patri*. It was designed to serve as a mnemonic word to enable singers to render the several Gregorian chants properly; each letter in Evovæ standing for the syllable whence it was extracted. The author of the article in Smith's *Christian Antiquities* says that the Evovæ must be regarded as containing the germ of the present accepted

views respecting musical accent. A modern imitation of the word was proposed by Mr. Dyce, but never came into use. It remains a mere curiosity, inasmuch as more obvious means exist of expressing accent.

EVREMOND, *āvr-mōng′*, CHARLES MARGOTELLE DE ST. DENIS, Seigneur DE ST.: 1613, Apr. 1—1703, Sep.; b. at St. Denis-le-Guast, Normandy: author and wit. He entered the army about the age of 15, became an ensign in less than a year, and 1637 had the command of a company of foot. About this time, he gained the favor and friendship of Turenne, Grammont, the Prince of Condé, and others of high rank, all of whom were delighted with his wit and cheerfulness. Having talked himself into the esteem of these men, it was not long until, by the same means, he brought himself under their displeasure. In 1661 his unbridled indulgence in raillery compelled him to take refuge in England. Many attempts were made at the French court to induce Louis XIV. to recall St Evremond, whose accomplishments, gayety, and wit rendered him the delight of all who had not smarted from his sarcasm; but Louis remained immovable until 1689, when he granted the exile permission to return. It was now, however, too late. St. Evremond had by this time surrounded himself with an admiring circle of the wits and beauties of the English court, and resolved to remain where he was. He died in his 91st year. St. Evremond's works, comprising comedies, classical essays, etc., were correctly published first by Des Maizeaux, with a life of the author (Lond. 1704): they are translated into English by the same editor.

EVREUX, *ĕv-rŭh′* (anciently *Mediolanum*, and more recently *Eburovices*): episcopal city of France, dept. of Eure, of which it is cap.; pleasantly situated in a valley on the Iton, a feeder of the Eure, 60 m. w.n.w. of Paris. It is well built, its streets regular, and the environs prettily laid out in promenades, gardens, and vineyards. The principal building of Evreux is the cathedral, which dates from the 11th c. Other buildings of note are the abbey church of St. Thaurin, originally built over the tomb of St. Thaurin, first bishop of Evreux, and having a shrine executed in the 13th c., which formerly contained his relics; the Bishop's Palace, built 1484; and the *Tour de l'Horloge* of the same century. Evreux has extensive manufactures of bed-ticking, woolen stuffs, cotton-yarn, leather, vinegar, and a trade in its manufactures, and in grain, seeds, timber and liqueurs.—Evreux is remarkable for the numerous sieges which it has sustained. It was taken by Clovis from the Romans; was sacked and plundered 892 by the Northmen, under Rollo; was burned by Henry I. of England 1119; and twice captured (1194 and 99) by Philippe Auguste, King of France, into whose hands, after a short time, it permanently came. It was frequently taken and recovered in the wars between France and England during the reigns of Henry V. and Henry VI. of the latter country. Pop. 12,000.

Vieil Evreux (*Old Evreux*), village near Evreux, supposed site of the anc. Mediolanum, has some ancient remains of a theatre, an aqueduct, and fortifications.

EWALD, *ā'vâlt*, Georg Heinrich August von: 1803, Nov. 16—1875, May; b. Göttingen; distinguished orientalist. He showed predilection for Oriental literature even in his school-days. He studied at the univ. of his native place, and while a student wrote *Die Composition der Genesis* (Braunschw. 1823). In 1823, he became a teacher at the Wolfenbüttel gymnasium; in 1827, extraordinary, and in 1831, ordinary, prof. of philosophy at Göttingen; in 1835, was appointed nominal prof. of the Oriental languages. Travels in search of Oriental mss. led him, in 1826, 29, and 36, to Berlin, Paris and Italy. After the death of Eichhorn, the critical exegesis of the Old Testament was included in his duties as prof. The first, and perhaps the most important fruit of his new labors, was his Critical Grammar of the Hebrew Language (*Kritische Grammatik der Hebr. Sprache*, Leip. 1827), an abridgment of which was published Leipsic 1835 (*Grammatik der Hebr. Sprache;* 5th edit. 1844); and a still simpler epitome 1842 (*Hebr. Sprachlehre für Anfänger*). Before this, however, Ewald had acquired high reputation by his work on Canticles (*Hohe Lied Salomo's*, Gött. 1826); his Commentary on the Apocalypse (*Commentarius in Apocalypsin*, Leip. 1828); his Poetical Books of the Old Testament, 4 vols. (*Die Poetischen Bücher des Alten Bundes*, Gött. 1835–37); and his Prophets of the Old Testament, 2 vols. (*Die Propheten des Alten Bundes*, 2 Bde., Stutt. 1840). Between 1843–50, Ewald published an important work in 4 vols., on the History of the People of Israel until the Time of Christ (*Geschichte des Volkes Israel bis auf Christus;* Eng. trans. 1869–74), and a subsidary vol. on the Antiquities of the People of Israel (*Die Alterthümer des Volkes Israel*). The *Geschichte des Volkes Israel*, together with its two continuations, The History of Christ and his Time (*Geschichte Christus und seiner Zeit*, 1857), and The History of the Apostolic Age, etc. (*Geschichte des Apostolischen Zeitalters bis Zurstörung Jerusalems*, 1858), is regarded at Ewald's greatest work. But Jewish history and literature did not limit the sphere of Ewald's wonderful activity. His lectures at Göttingen embraced the literature of the Arabic, Persian, Aramaic, and Sanskrit tongues, and gave birth to such works as that on the Metres of the Arabian Songs (*De Metris Carminum Arabicorum*, Leip. 1825); on Some of the Older Sanskrit Metres (*Ueber einige ältere Sanscrit-Metra*, Gött. 1827), an epitome of the Arabic author Wakidi's work on Mespotamia (*De Mesopotamiæ expugnatæ Historia*, Gött. 1827), and a Grammar of Arabic, entitled *Grammatica Critica Linguæ Arabicæ cum brevi Metrorum Doctrina*, 2 Bde. (Leip. 1831–33). In 1832, Ewald published at Göttingen several very important Dissertations on Oriental and Biblical Literature (*Abhandlungen zur orient. und biblischen Literatur*), and planned the well-known periodical, Journal for the

Knowledge of the East (*Zeitschrift für die Kunde des Morgenlands*). Ewald was not only a scholar and philologist, but a man of strong political convictions. Having, with six of his colleagues (the brothers Grimm, Dahlmann, Gervinus, Weber, and Albrecht), protested against the abolition of constitutional law and liberty in Hanover by the new sovereign, Ernest Augustus (previously Duke of Cumberland), he was dismissed from his situation, 1837, Dec. 12, and went to England to investigate its public libraries, whence he was called to Tübingen 1838, as prof. of theology. Here he remained ten years. In 1841, he was ennobled by the king of Würtemberg. In 1848, Ewald returned to Göttingen, where he established a Year-book of Biblical Science (*Jahrbuch der biblischen Wissenschaft*), in which, as well as in his work on the Synoptic Gospels (*Die drei ersten Evangelien*, Gött. 1850), and works on the Epistles of Paul (*Die Sendschreiben des Apostels Paulus übersetzt und erklärt*, Gött. 1857), he strove to give a firmer basis to New Testament criticism and exegesis. Ewald also gave great attention to Ethiopic literature, a result of which is his valuable Dissertation on the Book of Enoch (*Ueber des Æthiopischen Buches Henoch Entstehung*, etc., Gött. 1856). Later works were *Das Sendschreiben an die Hebräer und Jacob's Rundschreiben* (1871); and *Sieben Sendschreiben des Neuen Bundes* (1871). The distinguishing peculiarity of Ewald, as theologian and critic, was his love for the concrete forms in which divine truths are revealed in history, and his dislike of the abstractions into which they are refined away by over-speculative theologians. He regarded it as the especial glory of the Jewish people, that they never lost sight of the concrete—as the Persians and Hindus, for example, did, with whom the realities of religion vanished into the most intangible dreams—but kept it ever before them until, in the fullness of times, there was born among them Jesus of Nazareth, the Perfect and Only One, in whom humanity reached its spiritual consummation. Ewald refused to class himself or to be classed with any theological party in Germany. He was equally opposed to the extreme left represented in Tübingen, and to the extreme right represented in the modern Lutheran movement headed by Hengstenberg. When Hanover was in 1866 incorporated with Prussia, Ewald declined to take the new oath of allegiance, and was accordingly required to retire from the functions of the professoriate. He returned to political life; and as the three times elected representative of the town of Hanover in the Reichstag, persistently opposed the new political conditions.

EWALD, *ā'vâld* or *ā'vâl*, JOHANNES: 1743, Nov. 18–1781; b. and d. in Copenhagen: lyric poet of Denmark. In his 16th year, when his friends were about to send him to the Univ. of Copenhagen, his impatience of restraint led him to escape to Germany, where he entered as a private soldier in the army of Frederick the Great of Prussia, from which he soon deserted to the Austrians.

His bravery having attracted the notice of his superiors, he was offered a commission, which he refused, as it would have obliged him to become a Rom. Cath.; and having induced his friends to purchase his discharge, he returned to Copenhagen 1760, after having taken part in the great campaigns of 1759–60. He then began the study of theology, but a disappointment in love turned him toward poetry. His funeral ode on the death of Frederick V. of Denmark, 1767, showed original genius, and gave him rank among the best writers of his country. This was followed by numerous tragedies, operas, and songs, remarkable for lyrical beauty. In 1770, appeared the prose tragedy of *Rolf Krage*. Although *Balder's Doed* (1773), which breathes the heroic spirit of the ancient bards of the north, and exhibits the specially national tendency of Ewald's genius, is regarded by some critics as his *chef-d'œuvre*, *Fiskerne*, 'The Fishermen' (1780), probably deserves rank equally high, when considered as a mere lyrical production. His habits of dissipation, and his decided political opinions brought him into difficulties of every kind, while his infirmities of temper, and irregularities of conduct, estranged the affection of his nearest relatives, and in the latter years of his unhappy life he was often indebted to strangers for subsistence. Some of his nautical songs have been raised to the dignity of national odes. He was engaged at his death in compiling an autobiography, and the complete edition of his writings, which appeared 1792. His works have been edited by F. L. Liebenberg (Copen. 1850–55); and a life compiled from unpublished materials, has recently appeared from the pen of F. C. Olsen, of Copenhagen.

EWART, James Cossar, British zoologist: b. Penicuik, near Edinburgh, 1851, Nov. 26. He was educated at Edinburgh University, where he graduated M.D., and was appointed demonstrator of anatomy 1874. In 1875 he became conservator of the museum, University College, London; in 1878 professor of natural history, Aberdeen University; and in 1882 professor of the same, Edinburgh University, when he was also appointed member of the Scottish Fishery Board. In London he made researches into the bacillus of splenic fever, etc., and at Aberdeen founded the first marine laboratory in Britain, where, with the late Dr. Romanes, he made researches into the locomotor system of the echinoderms, which was the subject of the Croonian lecture of the Royal Society 1881. He conducts the fishery investigations into the fertilization and life history of the herring, whitebait, and other food-fishes, and directs a large corps of assistants in the work at various stations. He established lectureships in his university in embryology and the philosophy of natural history, and organized, for the students, a union. At Penicuik he has conducted the costly experiments, with which his name is widely known, into the development of the horse, and hybridizing of equine species, including the quagga, zebra, and island

pony, in different ways; and disproved the hoary theory as to the influence of previous impregnation (telegony).

EWDEN-DRIFT: see EWIN-DRIFT.

EWE, n. *ū* [AS. *eowu;* Dut. *ouwe,* a female sheep: Gr. *ois;* L. *ŏvĭs,* a sheep]: a female sheep.

EWE-GOWAN, n. *-gow'an:* in *bot.,* the common daisy (*Bellis perennis*).

EWELL, *yô'ĕl,* RICHARD STODDERT: 1817, Feb. 8–1872, Jan. 25; b. Georgetown, D. C.; soldier. He graduated at the U. S. Milit. Acad. 1840, served in the 1st U. S. dragoons at Contreras and Churubusco, Mexico, 1847, Aug.; became capt. 1849, Aug. 4; was in the campaign against the Apache Indians in N. Mex., 1857, June; resigned his commission 1861, and entered the Confederate army as lieut.col. He took part in the engagements and battles at Blackburn's Ford, 1861, July 18; Bull Run, July 21; Warrenton turnpike (where he lost a leg), 1862, Aug. 28; Front Royal, Cross Keys, Port Republic, and Cedar Mountain; and (as lieut.gen. and commander of the 2d corps of Gen. Lee's army after the death of Gen. 'Stonewall' Jackson), Winchester, Gettysburg, the Wilderness, and Spottsylvania Court-house. Subsequently he was relieved from field duty on account of disabilities, given command of the dept. of Richmond, and captured with his entire force by Gen. Sheridan at Sailor's Creek, 1865, Apr. 6. He afterward settled in Springfield Tenn.

EWER, n. *u'ĕr* [F. *aiguière,* a water-vessel—from L. *aqua;* OF. *aigue,* water: OF. *eauier,* a gutter]: the large jug belonging to a wash-hand basin; a water-jug; a pitcher. EWRY, n. *ū'rĭ,* an officer of the royal household who takes care of the table linen, and serves up water in ewers after dinner.

EWING, *yô'ĭng,* FINIS: 1773, July 10—1841, July 4; b. Bedford co., Va.: Cumberland Presb. clergyman. He settled near Nashville, Tenn., on the death of his parents; was licensed to preach 1800, and was ordained a Presb. clergyman by the Cumberland Presbytery 1803. The synod of Ky. refused to recognize his ordination, and was sustained by the Presb. gen. assembly; whereupon with two others he organized the Cumberland Presb. Church, 1810. He preached in Todd co., Ky.; Cooper co., Mo., and at Lexington, Mo., till his death; and was author of *Lectures on Divinity,* in which he formulated the tenets of the new denomination.

EWING, JAMES ALFRED, Scotch engineer: b. Dundee 1855, March 27. From early childhood his mind was bent on the study of scientific subjects, especially mechanical engineering, and after receiving an elementary education at the Dundee High School, he took a course of scientific studies at the University of Edinburgh. For several years until 1878 he was assistant in telegraph engineering, in which year he was appointed to the chair of mechanical engineering at the University of Tokyo, Japan. During his term of five years as instructor there he did much im-

portant work in measuring the vibrations of the earth during an earthquake by means of instruments of his own invention. So entirely new, original, and exhaustive were these investigations that in 1883 the university published them under the name *Earthquake Measurement*; the Seismological Society of Japan also published some of the results of his researches. In 1883 he returned to Dundee, where he became professor of engineering in University College; in 1890 accepting the professorship of applied mechanics at Cambridge. He has published: *Magnetic Induction in Iron and Other Metals* (1892); *The Steam Engine and Other Heat Engines* (1894); *The Strength of Materials* (1899); etc.

EWING, Juliana Horatia Gatty, English writer for young people: b. Ecclesfield, Yorkshire, 1841; d. Bath, Somerset, 1885, May 13. She contributed largely to a magazine started by Mrs. Gatty, her mother. On her mother's death the magazine was edited by her and her sister conjointly, and many of her best stories first appeared in it. Of her delightful tales of child-life we may mention: *Mrs. Over-the-Way's Remembrances* (1869); *The Brownies* (1870); *A Flat-iron for a Farthing* (1873); *Lob-lie-by-the-Fire* (1874); *Six to Sixteen*; *Jan of the Windmill* (1876); *A Great Emergency* (1877); *We and the World* (1881); *Old Fashioned Fairy Tales*; *Brothers of Pity* (1882); *The Doll's Wash; Master Fritz; Our Garden; A Soldier's Children; Three Little Nest Birds; A Week Spent in a Glass House; A Sweet Little Dear; Blue Red* (1883); and *Jackanapes* (1884). A biography by her sister, Horatia K. T. Gatty, was published in 1885 under the title *Juliana Horatia Ewing and Her Books.*

EWING, Thomas, ll.d.: 1789, Dec. 28—1871, Oct. 26; b. near West Liberty, Va.: lawyer. He removed with his parents to Ohio 1792; was taught the early branches by an elder sister, prepared himself for college while working in the Kanawha salt factory, cleared his father's farm from debt with his own earnings, and graduated at Ohio Univ., Athens, 1815. In the following year he was admitted to the bar and practiced with success till 1831, when he was elected U. S. senator as a whig. On the expiration of his term he resumed practice. In 1841, he was appointed sec. of the U. S. treas., and 1849 sec. of the new dept. of the interior, which he organized. On the appointment of Thomas Corwin as sec. of the treas. 1850, Ewing was appointed to succeed him in the U. S. senate, served there about a year, and then retired from public life. He resumed practice at Lancaster, O., and became one of the foremost practitioners before the U. S. supreme court. Ewing adopted Gen. William T. Sherman when 9 years old, appointed him to the U. S. Milit. Acad., and gave his daughter to him in marriage 1850.

EWING, Thomas, Jr.: lawyer and soldier: b. Lancaster, O., 1829, Aug. 7; d. 1896, Jan. 1. He was educated at Brown Univ., was private sec. to President Taylor 1849–50, studied law in Cincinnati, and was admitted to

the bar, removed to Leavenworth, Kan., 1856, was a member of the constitutional convention 1858, and the first chief-justice of the state 1861–2. In 1862 he recruited the 11th Kan. vols.; was elected its col.; took part in the battles of Fort Wayne, Cane Hill, and Prairie Grove; was commander of the Mo. and Ark. border dist.; held Pilot Knob with 1,000 men against several attacks by Confederates under Gen. Sterling Price 1864, Sep.; was promoted brig.gen. 1863, Mar. 13, and brevetted maj.gen. of vols. 1865. He was a member of congress from Ohio 1877–81, and the unsuccessful candidate for gov. 1879; and after 1882 resided and practiced law in New York.

EWT: see EFT, or NEWT.

EX, prefix, *ĕks* or *ĕgz* [L. and Gr. *ex;* Gr. *ek*]: out of; out; off; from; without; denoting merely increase of the power of the simple word. Ex assumes the forms E, Ec, Ef, according to the letter beginning the word of which it forms the prefix. Ex prefixed to the name of an office denotes that the person formerly held the office named, but does not now hold it, as *ex-mayor, ex-minister.* EX OFFICIO, *ĕks ŏf-fĭsh′ĭ-ō* [L. *ex,* from; *officio,* office]: by virtue of office. EX PARTE, *ĕks pâr′tē* [L. *ex,* from; *parte,* a part or side]: partial.

EXACERBATE, v. *ĕks-ăs′ėr-bāt* [L. *exacĕrbātus,* provoked, irritated—from *ex,* out of; *acer′bus,* bitter, harsh]: to exasperate; to inflame angry passions; to irritate highly. EXAC′ERBATING, imp. EXAC′ERBATED, pp. EXAC′ERBA′TION, n. *-bā′shŭn* [F.—L.]: the act of irritating highly; the irritation itself; increase of violence in a disease; also EXAC′ERBES′CENCE, n. *-bĕs′ĕns.*

EXACT, a. *ĕgz-ăkt′* [F. *exact*—from L. *exactus,* demanded, required—from *ex,* out of; *actus,* done, driven]: very correct or regular; accurate; precise; punctual; methodical; particular; careful; nice. EXACT′, v. [OF. *exacter,* to extort—from mid. L. *exactārĕ,* to exact—*lit.,* to drive out]: to force to pay or yield; to demand or require authoritatively; to extort. EXACT′ING, imp.: ADJ. harsh; severe; unyielding; compelling to pay or give. EXACT′ED, pp. EXAC′TER or EXAC′TOR, n. *-tėr,* one who exacts. EXAC′TION, n. *-ăk′-shŭn* [F.—L.]: the act of demanding with authority; that which is exacted; extortion. EXACT′NESS, n. *-ăkt′nĕs,* accuracy; regularity. EXACT′LY, ad. *-lĭ.* EXACTITUDE, n. *ĕgz-ăk′tĭ-tūd* [F.—L.]: exactness; accuracy.

EXACTIONS, a legal term of ecclesiastical jurisprudence, used in the Middle Ages to denote such duties or contributions, demanded by the clergy of their parishioners, as were extraordinary, either because they were new and against custom or because their amount was unduly increased. They were illicit, and it was found necessary repeatedly to denounce their unlawfulness. The power of the clergy over their parishioners, or of the bishops over the subordinate clergy was so great that it was easy for them to make the most outrageous exactions. In

589 the third Council of Toledo forbade the practice, but it became necessary for Leo IV. in 853, and later, Alexander III., in 1179, to repeat the prohibition.

EXACT SCIENCE: knowledge of the causes, effects, conditions and origin of a phenomenon, of its differences and likenesses to other phenomena, is science, but an exact knowledge of these relations involves also an estimate of the degree of relationship—a statement of the results in quantitative, or measure, terms. Exact science is quantitative as distinct from qualitative. No science is yet fully exact, while all sciences possess quantitative features to some extent. Sciences are generally termed exact when their quantitative features predominate. Thus physics and mathematics are exact sciences *par excellence*. Studies dealing with the phenomena of life, such as biology, physiology and psychology, are as yet mainly qualitative, though many of their phenomena are now being stated in rough quantitative terms. The term exactness is also used to refer to full and complete knowledge of a phenomenon. The test of completeness is the ability to predict. Thus our knowledge as to the orbit of a planet or comet is exact when we are able to predict with certainty every phase of its future. Our knowledge of historical forces will be exact in proportion as we are able to predict with certainty as to the future. But this exactness again depends upon quantitative results, so that we may be able to estimate accurately the relative efficiency of the various causal influences.

EXACUM, n. *ĕgs'a-kŭm* [L. *ex*, out: *ago*, I drive; because the plant is said to have the power of expelling poison]: genus of gentians, tribe *Gentianeæ*. The old *Exacum filiforme* is now *Cincendia filiformis*.

EXÆRESIS, n. *ĕgs-ē'rĕ-sĭs* [Gr. *exaireō*, I take away, I remove; *ex*, out, away; *haireō*, I take]: in *surg.*, that branch of surgery which relates to the removing of parts of the body.

EXAGGERATE, v. *ĕgz-ăj'ėr-āt* [L. *exaggĕrātus*, increased by heaping up—from *ex*, out of; *agger*, a heap; It. *esagerare:* F. *exagérer*]: to enlarge beyond the truth; to color highly; to tell more than the truth. EXAG'GERATING, imp. EXAG'GERATED, pp. EXAG'GERA'TION, n. *-ā'shŭn* [F.—L.]: telling more than the truth; hyperbolical representation. EXAG'GERATORY, a. *-tėr-ĭ*, containing exaggeration.

EXALBUMINOUS, a. *ĕks'ăl-bū'mĭ-nŭs* [L. *ex*, out of, and *albumen*]: in *bot.*, applied to a seed which has no distinct albumen, or none but what is contained within the cotyledons themselves.

EXALT, v. *ĕgz-awlt'* [F. *exalter*, to exalt—from L. *exaltārĕ*, to raise, to elevate—from *ex*, out of; *altus*, high: It. *exaltare*]: to raise high; to elevate in power, wealth, dignity, or fame; to elevate the tone of, as the voice; to magnify; to extol. EXAL'TING, imp. EXAL'TED, pp. EXALTATION, n. *ĕgz'awl-tā-shŭn* [F.—L.]: the act of exalting; elevated state; state of greatness or dignity. EXAL'TEDNESS, n. EXALTER, n. *-ėr*, one who exalts.—SYN. of 'exalt': to raise; elevate; erect, hoist; lift; heighten; dignify; promote; glorify; inspire; elate.

EXAMINE, v. *ĕgz-ăm'ĭn* [F. *examiner*—from L. *examĭnārĕ*, to try, to try by weight: It. *esaminare*]: to inspect carefully with a view to discover the real state of; to search or inquire into; to try by experiment, rule or law; to scrutinize; to test the qualifications of by questions. EXAM'INING, imp. EXAM'INED, pp. *-ĭnd*. EXAM'INABLE, a. *-ă-bl*, that may be inquired into. EXAM'INER, n. one who. EXAM'INATOR, n. *-tėr*, one who. EXAM'INA'TION, n. *-ā'shŭn* [F.—L.]: careful observation or inspection; investigation, scrutiny by study or experiment; research; test of knowledge by questions. EXAMEN, n. *ĕgz-ā'mĕn* [L. that which examines, the tongue of a balance]: examination; the tongue on the beam of a balance, rising perpendicularly from it. CROSS-EXAMINATION, in *law*, examination of a witness with the view of shaking his evidence formerly given. EXAMINATION OF A PRISONER, in *Scotland:* see DECLARATION.—EXAMINATION OF A WITNESS: see EVIDENCE.—SYN. of 'examination': search; inquiry; scrutiny; inspection; exploration; exploitation; inquisition; debate.

EXAMPLE, n. *ĕgz-ām'pl* [F. *exemple;* OF. *example*—from L. *exemplum*, a model or copy, a sample: It. *esempio*]: a pattern, copy, or model; a specimen; one as an illustration of the whole; a former instance; that which, or the person who, is proper for imitation; one punished for the warning of others; an illustration of a rule or precept.—SYN.: instance; illustration; copy; case; sample; precedent; exemplification; warning; caution.

EXANIMATE, a. *ĕgz-ăn'ĭ-māt* [L. *ex*, *anĭma*, life, spirit]: destitute of life; spiritless: V. to render destitute of life or animation; to dishearten. EXAN'IMATING, imp. EXAN'IMATED, pp.

EX ANIMO, phrase, *ĕks ăn'ĭ-mō* [L.]: from the soul.

EXANNULATE, a. *ĕks-ăn'nū-lāt* [L. *ex;* Eng. *annulate*]: in *bot.*, not having an annulus or ring around the spore cases. Used of certain ferns. Of the three orders of Filicales, two, *Ophioglossaceæ* and *Danæaccæ*, are ringless, and one, *Polypodiaceæ*, is ringed.

EXANTHALOSE, n. *ĕks-ăn'tha-lōs* [Gr. *exantheō*, I put out flowers; *hals*, salt]: white efflorescence such as results from exposure of Glauber's salt. Composition: sulphuric acid 42·5 to 44·8; soda 33·4 to 35; water 18·8 to 20·2. Found in Vesuvian lavas and at Hildesheim.

EXANTHEMA, n. *ĕks'ăn-thē'mă* [Gr. *exanthēmă*, a blossom, an eruption—from *ex*, out of; *anthos*, a flower]: in *med.*, an eruption—one of a class of contagious or infectious febrile diseases attended by distinctive eruptions on the skin, appearing at a definite perod, and running a recognizable course. To this class belong small-pox, chicken-pox, measles, scarlet fever, and German measles. EX'ANTHE'MATA, n. plu. *-thē'mă-tă.* EX'ANTHE'MATOUS, a. *-thē'mă-tŭs*, pertaining to. EXANTHEMATOLOGY, n. *ĕks-ăn-thĕ-ma-tŏl'-ŏ jĭ* [Gr. *ĕxanthēma; logos*, a discourse]: a department of medical science which treats of exanthemata or eruptions.

EXANTLATE, v. *ĕks-ănt'lāt* [L. *exantlatus*, pp. of *exantlo*, I draw out, I suffer; Gr. *exantleō*]: to draw out; to exhaust; to wear out; to waste away.

EXARCH, n. *ĕks'ârk* [Gr. *exar chŏs:* L. *exar'chŭs:* F. *exarque*—from Gr. *archē*, source, authority]: a viceroy; applied specially to viceroys under the Eastern emperors; an official in Greek churches. EXAR'CHATE, n. *-âr'kāt*, dignity of an exarch; department governed by him.—*Exarch* was the title conferred first by Justinian on his commander-in-chief and vicegerent in Italy. The conquest of Italy by the Goths in the early part of the 6th c. was a severe blow to the Byzantine pride; and Justinian determined to wipe out the disgrace, and recover the imperial territories. The execution of this project was intrusted first to Belisarius (q.v.), afterward to Narses (q.v.), by whom the reconquest of Italy was effected. The latter was the first who bore the title of exarch; and the district over which he ruled was called the *Exarchate.* The seat of the exarch was Ravenna, the towns and territories belonging to them being governed by subordinate rulers, styled *Duces* or Dukes. The extent of the exarchante, however, was gradually diminished, until it embraced only the country about Ravenna, the present Romagna, and the coasts of Rimini as far as Ancona. This was brought about partly by the conquest of the Longobards, partly by the dukes of Venice and Naples making themselves independent. In 728, even this small portion fell, for a short time, into the hands of the Longobards. In 752, Astulf, or Astolphus, King of the Longobards, put an end to Byzantine rule at Ravenna; but in 755 he was compelled to resign

the exarchate to Pepin the Less, King of the Franks, who gave it over to the Bp. of Rome, Stephanus II.—In the Christian Church, exarch was originally a title of the bishops, afterward of a bishop who presided over several others—a primate. It was borne by the bishops of Alexandria, Antioch, Ephesus, Cæsarea, and Constantinople, till it was finally exchanged for the title of Patriarch. A superior over several monasteries was also called in ancient times an exarch. The same title is borne, in the modern Greek Church, by the person who 'visits' officially, as a sort of legate of the patriarch, the clergy and churches in a province.

EXAREOLATE, a. *ĕks-ăr-ē'o-lāt* [L. *ex.*, *areola*, a small open place]: in *bot.*, not spaced out.

EXARILLATE, a. *ĕks-a-rĭl'lāt* [L. *ex;* Eng. *arillate*]: in *bot.*, not having an aril.

EXARISTATE, a. *ĕks-a-rĭs'tāt* [L. *ex; aristatus*, having awns]: in *bot.*, not having an arista, an awn, or a beard.

EXASPERATE, v. *ĕgz-ăs'pĕr-āt* [L. *exăspĕrātus*, roughened, stirred up—from *ex*, out of; *asper*, rough: It. *esasperare:* F. *exaspérer*]: to irritate to a high degree; to excite to great anger; to enrage or provoke greatly: Adj. in *bot.*, clothed with hard, stiff, short points. Exas'perating, imp. Exas'perated, pp. Exas'pera'tion, n. *-ā'shŭn* [F.—L.]: the act of exciting to violent anger; an extreme degree of anger. Exasperater, n. *-tĕr*, one who exasperates, irritates, or provokes.—Syn. of 'exasperate': to aggravate; irritate; provoke; enrage; incite; inflame; imbitter.

EXCÆCARIA, n. *ĕks-sē-kär'ĭ-a* [L. *excæco*, I make blind, which the juice of the plant is said to do, while even the smoke is deleterious to the eyes]: in *bot.*, genus of *Euphorbiaceæ*, tribe *Hippomaneæ*. *Excaecaria Agallocha* received its specific name from the erroneous belief that it produced the agalloch or aloes wood.

EXCAMB, n. *ĕks'kăm* [mid. L. *excambĭārĕ*, to exchange]: in *Scots law*, an exchange of one piece of land for another; also Excam'bion, n. *-bĭ-ŏn*, and Excam'bium, n. *-bĭ-ŭm*. Excamb', v., and Excam'bie, v. *-kăm'bĭ*, to exchange one piece of land for another.

EXCARNATE, v. *ĕks-kâr'nāt* [mid. L. *excarnātus*, stripped of flesh—from L. *ex.*, out of; *carnem*, flesh]: to deprive or clear of flesh. Excar'nating, imp. Excar'nated, pp. Excar'nifica'tion, n. *nĭ-fĭ-kā-shŭn* [L. *facĭō*, I make]: the act of depriving of flesh.

EX CATHEDRA, a. or ad. *ĕks' kă-thē'dră* [L. *ex*, from; *cathĕd'ra;* Gr. *kathĕd'ră*, a chair]: with authority or dogmatism, in allusion to a professor or teacher; with an air of official authority.

EXCAVATE, v. *ĕks'ă-vāt* [L. *excăvātus*, hollowed out—from *ex*, out of; *cāvŭs*, hollow]: to scoop or dig

out; to hollow. EX'CAVATING, imp. EX'CAVATED, pp. EX'CAVATER, n., *-vā-tėr*, one who; a machine for cutting into rocks. EX'CAVA'TION, n. *-shŭn* [F.—L.]: a hollow cavity or pit formed by digging out earth; the act of digging out earth.

EXCAVATOR: a machine for digging, moving, and transporting gravel, soil, etc. Excavators are made of two kinds, each adapted for different kinds of work. In making a long cutting, the first to come into operation is operated on rails, and employs a large 'scoop' or bucket, with a lever heavy enough to counterbalance the bucket when filled with clay. The scoop is lowered and driven into the bank until full. It is then raised by the suspension chain, and dumped by the chain on the lever. The second class of excavator is employed to make the cutting wider. Its sides are made sloping to an angle of 45°, and on the top of the bank a temporary line of rails is laid a few feet from the edge. The machine is placed on the rails at the end of the cutting; the jib is lowered until the row of buckets it carries can cut into the clay; these scrape up the bank, reaching the top of it full of soil; they next pass over the machine, and are emptied into the wagons beyond it.

EXCEED, v. *ĕk-sēd'* [F. *excéder*—from L. *excēdĕrĕ*, to go out, to withdraw—from *ex*, out of; *cēdō*, I go: It. *eccedere*]: to pass or go beyond; to excel; to surpass; to go too far; to go beyond any given limit. EXCEED'ING, imp.: ADJ. great in extent of duration; very large: AD. in a very great degree. EXCEED'ED, pp. EXCEED'INGLY, ad. *-li*, very; unusually, to a very great degree.

EXCEL, v. *ĕk-sĕl'* [F. *exceller*—from L. *excel'lĕrĕ*, to be high, to be eminent—from L. *ex, cello*, I impel or urge on: It. *eccellere*]: to surpass; to possess good qualities in a great degree; to do anything in a superior manner. EXCEL'LING, imp. EXCELLED', pp. *-sĕld'*. EX'CELLENCE, n. *-lĕns*, state of excelling; any valuable quality; also EX'CELLENCY, n. *-sĭ*. EX'CELLENCY, n. *-lĕn-sĭ*, a title of honor now given to viceroys, also to ambassadors, as representing not the affairs alone, but the persons of sovereign princes, to whom it was formerly applied. The privilege of being addressed as 'Your Excellence,' and of demanding a private interview with the prince to whom he is accredited, are the chief distinctions between the privileges of an ambassador and those of an envoy or minister plenipotentiary: see AMBASSADOR: EMBASSY. EX'CELLENT, a. *-lĕnt*, of great virtue, worth, or quality; highly useful; prime; select: highly desirable. EX'CELLENTLY, ad. *-lĭ*.—SYN. of 'excellence': superiority; worth; perfection; goodness; greatness; purity; eminence;—of 'excellent': worthy; valuable; choice; exquisite; distinguished; admirable; superior; excessive.

EXCELMANS, *ĕk-sĕl-mân*, or EXELMANS, RÉMI JOSEPH ISIDORE, *rā-mē zhō'zĕf ē-sē-dōr*, BARON: French marshal; b. Bar-le-duc, 1775, Nov. 13; d. 1852, July 10. He entered the army in 1791, served with distinction at Austerliz in 1805, and gained the rank of general of brigade for his conduct at Eylau in 1807. In the Russian campaign (1812) he commanded a division. He directed a corps at the battle of Waterloo, after which he passed four years in exile; was restored to his title as a peer in 1831, and became a marshal of France in 1851.

EXCELSIOR, a. *ĕk sĕl'sĭ-ŏr* [L. *excelsus*, lofty; *excelsĭŏr*, loftier]: more lofty; more elevated; higher still. EXCEL'SITUDE, n. *-tūd* [L. *excelsus*, high, lofty]: height.

EXCEL'SIOR (Lat. 'higher') (1) the motto of New York State. (2) A well-known poem by H. W. Longfellow, published in 1841, of which the opening words are: 'The shades of night were falling fast.' The poem in its musical setting became in America a favorite academic song.

EXCELSIOR, the trade name of a material invented in America and widely used for packing and stuffing in mattresses and upholstery. It is made from logs of wood which have first been divided into 18-inch blocks. The fibres are separated from the blocks with great rapidity by knife-points, and packed in bales of 250 pounds weight. Not far from 45,000 tons are annually manufactured in the United States, and of this output large quantities are exported.

EXCELSIOR GEYSER: a geyser in the Yellowstone National Park, and one of the largest in the world. It has thrown a column of water to a height of 200 to 300 ft. See YELLOWSTONE NATIONAL PARK.

EXCENTRIC, n. *ĕk-sĕn'trĭk* [see ECCENTRIC]: a wheel having the axis removed from the centre: ADJ. deviating from the centre; removed from the centre or axis. EXCENTRAL, a. *ĕks-sĕn'tral*, in *bot.*, out of the centre. EXCENTRICAL, a.: same as ECCENTRIC. EXCENTRICITY: same as ECCENTRICITY.

EXCENTROSTOMATA, n. *ĕk-sĕn-tro-stōm'a-ta* [Gr. *ekkentros*, out of the centre; *stoma*, mouth]: in *zool.*, name given by De Blainville to a family of *Echinida*, with an elongate, cordate body. Chief genera, *Spatangus* (recent), and *Annachites* (fossil).

EXCEPT, v. *ĕk-sĕpt'* [OF. *exceptcr*—from L. *exceptārĕ*, intensive of *excipĕrĕ*, to withdraw—from *ex*, out of; *căpĭō*, I take: F. *excipcr*]: to pass over; to take or leave out of any specified number; to object; to exclude. EXCEP'TING, imp.: PREP. without including; to the exclusion of. EXCEP'TED, pp. ADJ. left out; specially excluded. EXCEPT, conj. unless; without: PREP. exclusive of; not including; save; but. EXCEP'TION, n.

-sĕp'shŭn [F.—L.]: the act of excluding or leaving out of a certain number; that which is excluded or separated from others; the person or thing not included; an objection; dislike; slight offense taken; a saving clause in a formal writing. EXCEP'TIONABLE, a. *-ă-bl,* liable to objection. EXCEP'TIONAL, a. *-ăl,* forming an exception. EXCEPTIVE, a. *-tiv,* including an exception. EXCEP'TOR, n. *-tẽr,* one who. EXCEPT'LESS, a. in *OE.*, usual; that has not an exception. EXCEPTION PROVES THE RULE, the very fact of exceptions shows there must be a rule.

EXCERNENT, a. *ĕk-sẽr'nĕnt* [L. *ex,* out of; *cernen'tem,* separating, sifting]: in *med.*, connected with excretion.

EXCERPT, v. *ĕk-sẽrpt'* [mid. L. *excerptum,* a picking, an extract—from *ex,* out of; *carpo,* I pluck or take]: to select parts of any writings: N. an extract or selection from a writing. EXCERPTA, n. *-a* excerpts, extracts. EXCERP'TING, imp. EXCERP'TED, pp. EXCERPTION, n. *ĕk-sẽrp'shŭn,* an extract.

EXCESS, n. *ĕk-sĕs'* [OF. *excez,* superfluity—from L. *excessus,* retiring, withdrawing—from *ex,* out of; *cessus,* gone, departed: comp. *ex,* out of; Eng. *cess,* rate, measure—*lit,* out of all measure]: a passing or going beyond a certain measure or limit; more than enough; intemperance; difference between things unequal. EXCES'SIVE, a. *-sĭv,* being in excess; beyond any given measure or limit; unreasonable; extreme. EXCES'SIVELY, ad. *-lĭ,* in a great degree; exceedingly. EXCES'SIVENESS, n. the state or quality of being excessive. —SYN. of 'excess': superfluity; redundance; superabundance; immoderateness; dissipation; remainder.

EXCHANGE, v. *ĕks-chānj'* [F. *échanger;* OF. *eschanger,* to exchange, to barter—from L. *ex,* out of; F. *changer,* to change]: to give one thing for another; to resign or lay aside one state or condition and take another instead of it; to give and receive the like thing: N. the act of giving one thing or commodity for another; barter; the act of giving up one condition or state for another; a place where merchants meet, or the meeting itself—in this sense often written 'CHANGE. EXCHAN'GING, imp. EXCHANGED', pp. *-chānjd'.* EXCHAN'GER, n. one who deals in money in the way of giving the money of one country for that of another. EXCHANGE'ABLE, a. *-ă-bl,* fit or proper to be exchanged; that may be exchanged. EXCHANGE'ABIL'ITY, n. *-bĭlĭ'-tĭ,* the state or quality of being exchangeable. BILL OF EXCHANGE, a written order or promise to pay money for value received—issued in the country where payable it is called an *inland bill,* if payable in another country it is called a *foreign bill.* See BILL.—SYN. of 'exchange, v.': to traffic; truck; commute; bargain; interchange; deal; trade.

EXCHANGE.

EXCHANGE: is the term used, among other meanings, to designate the mode of paying debts due at another place without the transfer of actual money; it is hence also applied to the instruments (*drafts*) by means of which such payments are effected. It is one of the facilities invented with the development of commerce and credit, by the Italians. A sale of goods, or the establishment of a credit by other means, is presumed to have taken place, and upon the other hand a purchase of goods or the incurment of an obligation. Thus A in New York has due him from B in New Orleans $5,000; C in New York owes D in New Orleans a like sum; C purchases from A an order upon B to pay the money due to C or his assignee, which order (draft, or *bill of exchange*) C assigns by indorsement to D to whom it is forwarded; upon its receipt D collects the sum from B; which pays off two obligations without the risk and expense of transmitting the money hither and thither.

In modern practice the first instrument used is the *commecrial bill* representing the value of the goods shipped, generally accompanied by documents (bills of lading, insurance policies, etc.) evidencing the shipment, which are assurances of value receivable. These bills are usually payable in the future, say one to six months after date (or sight,) and are transmitted to the place where payable and in due course presented for *acceptance* by the party to whom the goods are consigned. This is done by bankers (or brokers) and the bills are discounted for the drawer, (the seller of the goods), who thus gets his money back for further use.

The banker who has forwarded the commercial bill to his banking correspondent or agency in the place where it is payable, generally also desires it discounted, in order that he may have a credit established against which he can draw drafts, known as *bankers' bills.* To facilitate this there are bankers who make a special business of discounting acceptances, carrying them until they are payable.

The first banker is now in position to provide such persons as may have payments to make in the place he has thus established a credit, with bills, usually payable at *sight* or demand.

Credits are however in great measure established otherwise, as by sales of securities, direct loans or advances by remittances of cash or other bankers' bills.

Transactions of this character with other countries are classed as *foreign exchange* (q.v.), whereas those within the country are classed as inland or domestic. Inasmuch as the several states of the Union retain jurisdiction over this subject and have varying laws, a draft drawn in one state payable in another is, in the law, treated as a foreign bill; this classification is however only a technical one.

The *rate of exchange,* i.e., the price for bills, varies, naturally, with the supply and demand; when the supply

of bills is greater than the demand the rate falls; when the demand is in excess it rises. The range of fluctuation is, however, limited, except in very extraordinary cases, by the cost of sending or drawing the actual cash; thus, assuming parity at 100, and cost of shipping at 1 per cent., the rate cannot rise appreciably above 101 nor fall below 99; since it would be cheaper to move the cash. The desire for cash being generally the chief motive, the interest or discount rates exert a potential influence upon exchange rates; the latter fall when interest rises, so as to induce shipments of cash, and *vice versa*. This is more clearly illustrated under *Foreign Exchange*.

Domestic Exchange.—In the United States the trend of internal commerce is, generally speaking, that agricultural and food products flow eastward and manufactured goods westward. Thus the course of exchange, so far as it depends upon commerce, may be called seasonal. But since the business is almost entirely in the hands of banks, and since banks in practice keep a very large part of their surplus moneys in the financial centers, and particularly in New York, the course of domestic exchange is more largely influenced by the varying (also seasonal) requirements for cash. Generally speaking, the interior points require much more actual cash during the late summer and fall to move the crops; much less during the remainder of the year. The surplus keeps moving to and from the centers.

The variations in the interest rates does not govern this movement to the extent that the need for actual cash does; for rates are almost always higher in the interior than at the centers, yet money flows to the latter regularly during the season of slackened demand (January to June). As soon as it is again needed those having credits at the centers must either have the cash forwarded or sell their bills to some one who will do so. At this date (June, 1907) the rates for domestic exchange upon New York are quoted as follows, per $1,000:—

Chicago, 5c premium; St. Louis, 40c premium; San Francisco, par.; New Orleans, $1. premium; Charleston, $1. premium; Savannah, 75c premium; Boston, 12c discount; St. Paul, 35c premium.

This indicates no special desire for cash at any point except Boston; San Francisco and Chicago appear to be nearing a point where a desire may arise.

Foreign Exchange.—The commerce of the world, which forms the basis of foreign bills, is now about $13,000,000,000 in value; the imports of one country being of course the exports of another. The balances of trade are not however determining factors, since international loans, interest payments thereon, travelers' credits and purchases and sales of securities are important elements. The evolution of credit has rendered it possible to avoid the expenses of transfer of gold (now the sole international debt-paying medium), by means of loans made specifically to defer actual payments, in anticipation of future com-

mercial transactions which will offset the debts. As explained (under *Exchange*), the commercial bill is the primary instrument; bankers' bills are drawn at sight and also at 30, 60 and 90 days; transfers are also made by cable. The measure of accommodation—procuring cash immediately or remotely—affects the rate for bills; thus on the same day commercial bills upon London were quoted at 4.815, bankers' 60 day bills at 4.816; bankers' sight bills at 4.859 and cable transfers at 4.865.

In the transactions the basis of computation is the value of the monetary unit of one country in terms of that of the other. The rule is not absolutely uniform: both New York and London quote bills upon each other in terms of the number of dollars to the £; New York quotes German bills on the basis of the value, in cents, of 4 marks; and French bills at the number of francs obtainable for a dollar.

In the first of the tables following the equivalents of the units of the principal countries in terms of the units of each of the others, are given; in the second the value of the units of other countries in United States money is given, classifying those having fixed gold standards, those having fluctuating silver standards and those having depreciated paper standards.

The quantity of gold worth $486.66, will bring £100 in London, 2522.2 francs in Paris, etc. There are, however, expenses of transfer and insurance and loss of interest to be reckoned; these have been reduced somewhat in the past decade, but still amount to say ¼ of one per cent in New York; bringing the cost of £100 laid down in London to about $487.90. Unless, therefore, a banker can sell drafts on London at a price higher than the rate thus indicated, he cannot ship gold profitably. Conversely gold cannot be imported with profit from London unless the rate for drafts falls below 4.85. In other words when the demand for drafts is greater than the supply, the price rises above the theoretic parity, and when it reaches the export point the anticipated profit induces some one to create a credit abroad against which drafts may be drawn; and when the supply of drafts is greater than the demand, and holders of foreign credits prefer not to ask for specie, the rate presently falls to a point at which some one in the business finds it profitable to demand payment in gold, and he purchases drafts representing the credits.

It is not an unusual occurrence that gold moves one way or the other before the 'gold points' are reached; those desiring gold frequently are willing to bear the loss of interest while the money is in transit; this obviously reduces the cost of the operation.

Again there is what is known as the 'triangular operation'; if for example, the rate at Paris upon London (theoretic parity 25.22 francs for the £) falls so that £100 may be purchased in Paris for 2512½ francs; and if the rate on London in New York is such that $487 equals

	Dollars.	Shillings.	Francs.	Marks.	Guilders.	Kronen.	Kronor.	Rubles.	Yen.	Rupees.
Dollar (U. S.)	.....	4.109	5.183	4.198	2.488	4.935	3.731	1.944	2.006	3.082
§£, 20 Shillings (British)	4.86⅔	.....	25.222	20.429	12.107	24.017	18.159	9.459	9.763	15.000
*Franc (French)	.19.3	.793	.....	.810	.480	.952	.720	.375	.387	.595
Mark (German)	.23.8	.979	1.235	.....	.593	1.176	.889	.463	.478	.734
‡Guilder (Dutch)	.40.2	1.652	2.083	1.687	.....	1.984	1.500	.781	.806	1.239
Krone (Austria-Hungary)	.20.3	.833	1.050	.851	.504	.....	.756	.394	.406	.626
Krone (Scandinavian)	.26.8	1.101	1.389	1.125	.667	1.323	.....	.521	.538	.826
Ruble (Russian)	.51.5	2.114	2.666	2.160	1.280	2.539	1.920	.....	1.032	1.586
Yen (Japanese)	.49.8	2.049	2.583	2.092	1.240	2.460	1.860	.969	.....	1.536
†Rupee (British India)	.32.4	1.333	1.684	1.362	.807	1.601	1.211	.631	.651	.....

*Same for Belgium, Algiers and Switzerland; for Italian *lira*, Spanish and Cuban *peseta*, Greek *drachma*, *markka* of Finland, Roumanian *lei*, Bulgarian *lev*, Servian *dinar*, Venezuelan *bolivar;* and $\frac{1}{6}$ of Argentine *peso*, Haitian *gourde*.

†Same for Ceylon. ‡Includes Java and colonies. §Includes Australasia, British South Africa and West Indies.

GOLD STANDARDS.

Dollar, Canada	$1.000
" British Honduras	1.000
" Newfoundland	1.014
Balboa, Panama	1.000
£E, Egypt	4.943
£T, Turkey	4.396
£P, Peru	4.86⅔
Peso, Mexico	.498
" Uruguay	1.034
" Philippines	.500
Colon, Cost Rica	.465

SILVER STANDARDS (AT PRICE OCTOBER, 1906).

*Tael, China	$0.808
Dollar, Straits	.523
Boliviano, Bolivia	.485
Sucre, Ecuador	.485
Peso, Central America	.485
Tical, Siam	.300
Kran, Persia	.089
Piastre Indo-China	.523

*Haikwan or customs tael.

DEPRECIATED PAPER STANDARDS.

Milreis, Portugal, gold	$1.080
" Brazil, gold	.546
Peso, Argentine, gold	.965
" Chile, gold	.365
Gourde, Haiti, gold	.965
Peseta, Spain, gold	.193
Drachma, Greece, gold	.193
Peso, Paraguay, gold	.965
" Colombia, gold	1.000

£100 and that on Paris in New York, will bring 516½ francs for $100; the resulting equation is $487 = 2515.35 francs; with which in Paris it is possible to purchase a little more than £100. The Paris-London rate thus frequently makes it profitable to send gold to Europe when the 'sterling' rate (New York-London) would not permit it. A in New York, sends B in Paris gold; B buys bills on C in London, remitting them to D for credit of A, who may then draw and sell his bills against it. In fact the transaction is usually consummated by cable as soon as the gold is on the ship.

An important consideration in the matter of gold shipments is the character of the metal. A payment to be made in London is primarily dischargeable in sovereigns; if the New York exporter can send this kind of coin not materially abraded, he has an advantage; if he undertakes to send United States coin that has been somewhat worn by use, he is at a disadvantage; for the international operations are based upon the rule that payments must be made either in the coin that is current legal tender at the place where the payment is due, or in an equivalent in value of gold in other forms. Foreign coins are hence treated as so much bullion as will result when they are melted down. It has been found expedient, therefore, to use gold in bar form as the most satisfactory medium for these transactions.

The value of gold is hence determined by weight and fineness; the ounce of pure gold being substantially the unit, at the rate of $20.67½ U. S., £4. 4sh. 11.45d. British, and 107.18 francs French. Bars are usually somewhat under 1000 fine; say .995.—In the calculation for London payments there must be a conversion to the British standard .916⅔, since London has the habit of quoting gold at that standard. This works out a par of £3. 17sh. 10½d., which is the exact amount coinable out of an ounce of gold British standard at that mint. But the mint cannot return the coin at once; therefore, in order to avoid the loss of interest due to delay, the Bank of England is required by law to pay out the coin for such bullion at the rate of £3. 17sh. 9d. the ounce standard (expressed usually 77sh. 9d.). This is hence the practical parity, which is the basis for calculation. When the Bank desires more gold it raises its price; thus the quotation at this writing (June, 1907), is 77sh. 10⅜d., which gives an appreciable margin for profit to exporters.

An important factor, already referred to, is the interest (or discount) rate. Naturally money tends to flow from a country where rates are relatively lower to one where they are relativelly higher; the qualification *relatively* is essential, because rates in the United States and Germany are ordinarily at a higher level than in France, for example. Therefore when the Bank of England desires to obtain more gold it will, if deemed necessary, in addition to raising its price for gold bars, increase its discount rate. By this device borrowers in London are compelled

to pay more or seek loans elsewhere; if the demands for loans continue money naturally flows from Paris, whose rate for bills upon London is brought to the shipping point. The Bank of France may however use its devices to divert the demand upon Berlin or New York, by causing such a fall in exchange rates upon those points as will bring gold from there.

Exchange rates are upon the whole the most sensitive index of international monetary conditions; the rates quoted upon any one day indicate where the demand for money is greater; but it generally transpires that in the course of the day, or soon thereafter, the rates are readjusted to reach a level. In the following table the situation at several points on the same day is shown:

INTEREST RATES (June 3, 1907)

New York	Time	4½%	Call	2 %
Paris	Bank	3½%	Open	3⅜%
Berlin	"	5 %	"	4½%
London	"	4 %	"	3⅜%

EXCHANGE—

	On London:		On Paris:		On Berlin:	
	Par	Rate	Par	Rate	Par	Rate
New York...	4.866	4.868	5.183	5.163	95.20	95.25
Paris.....	25.222	25.125				
Berlin.....	20.429	20.455				

The Paris-London rate indicated a desire for gold by France; when the New York-London rate rose to 4.87 Paris offered to allow interest on money in transit and New York shipped gold to Paris, with which bills upon London were purchased for New York account, against which New York sold its bills on London at a small profit. This movement in fact also protected Berlin where the rate was quite high, but no gold went out thence.

Exchanges between gold-standard and silver-standard countries are considerably disturbed owing to the fluctuation in the price of silver. In order to reach a more stable basis British India and Mexico have adopted the gold standard for international business; a similar plan obtains in the Philippine Islands, but has not yet worked out successfully; the Straits Settlements, Siam and Indo-China are experimenting in the same direction. This leaves China alone, among important nations, with the silver standard. Since commercial relations with the Far East usually involve extended credits (sometimes as long as one year), and as none can foresee what the price of silver may be several months in the future, the exchanges are upon a speculative basis; bills are discounted at a risk, which involves a higher charge; and this is a tax upon commerce.

Obviously a similar disturbing element exists in the exchanges with countries having depreciated currency and a varying gold premium. In Brazil, Chile and Argentina the assumption of control of monetary functions by the government, permits the maintenance of fixed gold premiums for periods, which serves a useful purpose; thus in Argentina the gold premium has for some time stood at 127.

EXCHA'NGE, Deed of: under the English common law, a mode of conveying equal interests in lands, the one in consideration of the other. In the United States, the common-law deed of exchange has become obsolete, and lands may be exchanged by the ordinary deed of bargain and sale. The words 'excambium' and 'excambion' (see Excamb) were synonymous with exchange, in the technical sense above referred to.

EXCHANGES, Military: certain arrangements made between officers of the English army. An officer may exchange, or change places, in the Guards, or Line, with another of equal rank in any regiment of the above corps, by mutual consent, and subject to the approval of the minister of war, and on payment of a sum agreed upon between the officers.

EXCHEAT, v. *ĕks-chēt'* [*ex, cheat*]: in *OE.*, same as escheat; N. in *OE.*, a fraudulent exchange.

EXCHEQUER, n. *ĕks-chĕk'ėr* [F. *échiquier;* OF. *eschequier,* a chessboard, checker-work—said to have been so called from the large-patterned checked cloth which covered the table of the Exchequer]: a treasury; in *familiar language,* cash or funds in hand; in *Britain,* a court of law having exclusive jurisdiction in all cases affecting the public revenue; one of the divisions of the high court of justice: V. to institute proceedings in the court of exchequer. Exche'quering, imp. Exche'quered, pp. *-ėrd.* Exchequer tallies, rude device in use till 1783 in the English Exchequer, for checking accounts. They were seasoned wands of ash, hazel, etc., duly inscribed and notched, then split, one one-half given to the payer. When he presented his half, if it were found to match the half retained, the proper payment was made to him.

EXCHEQ'UER, Chancellor of the: in Britain, in modern times, the first finance minister of the crown. Strictly speaking, he is the under-treasurer, the office of lord high treasurer being now vested in the lords commissioners of the treasury. When the prime minister is a member of the house of commons, he sometimes holds the office of chancellor of the exchequer. The judicial functions of the chancellor of the exchequer may now (since 1735) be considered matter only of history. See Exchequer, Court of.

EXCHEQ'UER, Court of: now merged in the high court of justice in England: formerly the court wherein all matters relating to the royal revenues were adjudicated. It is said (Madox, *Hist. of Ex.* i. 177) that as early as the reign of William the Conqueror a court of exchequer was in existence. This was probably nothing more than a branch of the *Aula Regia,* or great council of the nation, but on the subdivision of that court in the reign of Edward I., the court of exchequer acquired a separate and independent position. The special duty then assigned to the court was to order the

revenues of the crown, and recover the king's debts and duties. The court was then denominated the *Scaccarium* (from *scaccus or scaccum*, a chess-board), because a checkered cloth was anciently wont to be laid upon the table of the court (Madox, *Hist. of Ex.*). The court formerly consisted of two divisions, an equity, and a common law or plea side. Lork Coke (*Inst.* iv. 118) appears to doubt whether the equitable jurisdiction of the court can be traced back further than the statute 33 Henry VIII. c. 39. This equitable jurisdiction of the exchequer was abolished by 5 Vict. c. 5, and transferred to the court of chancery. On the first institution of the court of exchequer the business was confined chiefly to matters connected with the royal revenue, but a privilege was conceded to all the king's debtors and farmers, and all accountants of the exchequer, to sue and implead all manner of persons. Gradually the court of exchequer acquired a concurrent jurisdiction with the other courts of common law. The judges of the exchequer consisted originally of the lord treasurer, the chancellor of the exchequer, and three puisné judges, called barons of the exchequer. From 1873 to 81 the court constituted a division of the high court of justice, having a chief baron and four barons of exchequer. But by the Supreme Court of Judicature Act (1881), the power formerly exercised by the chief baron of exchequer, was transferred to the lord chief-justice of England.

The Court of *Exchequer Chamber*, established by 31 Edw. I. c. 12, was formerly a court of all the judges in England assembled for decision of matters of law (Coke, *Inst.* iv. 110, 119.) Its ordinary jurisdiction was as a court of error, in which capacity it revised the judgments of the three courts of common law. Since 1873, appeal lies from each division of the high court of justice in England, direct to the court of appeal, which succeeded to the jurisdiction formerly vested in the house of lords, as the supreme court of appeal, and consists of the lord chancellor, and the chiefs of the divisions, and the judges of the privy council.

In Scotland, before the Union, the exchequer was the king's revenue court. By 19 and 20 Vict. c. 56, the court of exchequer is abolished, and the jurisdiction transferred entirely to the court of session.

The Court of *Exchequer Chamber* in Ireland, established by 40 Geo. III. c. 39, was abolished as an intermediate court of appeal between the Irish courts and the high court in England.

EXCHEQUER BILLS, in England: bills issued at the Exchequer under the authority of acts of parliament, as security for money advanced to the government. They contain an engagement on the part of the government for the payment of the principal sums advanced with

interest. These bills form the chief part of the unfunded debt of the country. They were issued first in the reign of William III., 1696, and were drawn for various amounts from £100 to £5. At that time they bore interest at the rate of three-pence per day on a hundred pounds (Macaulay, *History of England*, iv. 700) the interest was reduced to 2*d.* during the reign of Anne. During the war 1793–1814, the rate of interest was usually 3½*d.* At present, it is generally from 1½*d.* to 2½*d.* per £100 per diem. Holders of these bills are exempt from all risk, except that arising from the amount of premium or discount they may have given for them. The bills, varying in amount from £100 to £1,000, pass from hand to hand as money, and are payable at the Treasury at par. They may be paid also to government in discharge for taxes. When it is intended to pay off outstanding Exchequer bills, public notice is given by advertisement. The advances of money to the government by the Bank of England are made on Exchequer bills. These bills are a convenient means whereby the government can meet a sudden demand for unusual expenditure.

EXCHEQUER OF THE JEWS: a department of the English Court of Exchequer (1200–1290), wherein the taxes and law-suits of the Jews were recorded, due to the estate left by Aaron of Lincoln, a prominent Jew of England, which was so large as to require the services of a special 'Aaron's Exchequer.' It was found necessary to register in duplicate all the debts due to Jews, which was finally connected with the Exchequer of Westminster called 'Exchequer of the Jews,' whose first recorded mention was in 1200 when the names of four justices are given, two of them Jews, who, with other officials, constituted the Exchequer. Its office was to deal with law-suits between Jews and Christians, chiefly in references to debts due the former over which it claimed special jurisdiction—a claim not always allowed, the King claiming a large share as contributions to the royal treasury, which accounted, in a measure, for the high rates of interest demanded by the Jews of their debtors. The subject, with its sidelines of tallage and starrs, or deeds annulling indebtedness, is of much interest, and has received much attention in England. See J. M. Rigg, *Select Pleas, Starrs and Records of the Jewish Exchequer* (London, 1902).

EXCIP'IENT [Lat. *excipio*, I receive]: inert or slightly active substance, introduced into a medical prescription as a *vehicle*, or medium of administration for the strictly medicinal ingredients. Thus, conserve of red roses, or bread-crumbs, is used to make up pills: sulphate of potass, or white sugar, in medicinal powders; water, mucilage, white of egg, and many other substances in fluid mixtures.

EXCIPULUS, n. *ĕk-sĭp′ū-lŭs*, or EXCIP′ULA, and EXCIPLE, n. *ĕk-sĭp′l* [L. *excĭpŭlă*, receivers, receptacles—from *excĭpĭō*, I catch, alluding to the roughness of the surface]: in *bot.*, a receptacle containing fructification in lichens; a minute species of black fungus found in autumn upon dead raspberry-stems.

EXCISE, n. *ĕk-sīz′* [L. *excīsus*, cut out or off—from *ex*, cut off; *cædo*, I cut: F. *excise*, tax on merchandise —*lit.*, a piece or part cut out or off]: a tax or duty levied on articles produced an consumed in a country, as on spirits, malt, etc.: a tax levied on licenses to pursue certain trades, and deal in certain commoditics: ADJ. pertaining to the duties levied on certain articles produced and consumed at home: V. to levy a tax on. EXCI′SING, imp. EXCISED′, pp. *-sīzd′*. EXCIS′ABLE, a. *-sīz′ă-bl*, liable to be taxed. EXCISE′MAN, n., or EXCISE-OFFICER, n. one who inspects and rates articles liable to excise duty. *Note.*—In the sense of a 'duty or tax on native commodities, etc.,' *excise* is clearly a corruption and an accommodation in popular etymology of sound to sense: the OF. *assise* was the assize or sessions at which commodities were assessed, and finally the taxes so imposed. From a similar source the Belgium *accüse* is tribute: comp. Sp. *sisa*, assize, excise; old Dut. *aksüs;* Ger. *accise*, excise: see ASSIZE.—*Excise* is not, according to its name, a part of the value of a commodity taken out and given to the public revenue; for the manufacturer who looks to a profit on his outlay merely counts the tax as part of his expenditure, which he intends to get back with a profit, so that it constitutes an addition to the ultimate price which the purchaser or consumer has to pay. A tax on commodities sold and bought is a very obvious one, but it has generally appeared in the simple shape of a toll on goods brought to market; and the complicated arrangements for officially watching the process of a manufacture for the purpose of seeing that none of the dues of the revenue are evaded, is of comparatively modern origin. It was introduced into England by the Long Parliament, who established an excise on liquors 1643. Though always unpopular, the excise in some form or other has ever since continued as a material element in the taxation and revenue of Britain. In the earlier part of last century Sir Robert Walpole entertained the notion of enlarging its productiveness while mitigating its proportional pressure, by the bonding system, which suspends the exaction of the duty until the goods are sold, and thus leaves the manufacturer all his capital to be devoted to production: see WAREHOUSING SYSTEM. But the rumor of an enlargement of the unpopular excise duty created a general excitement, and the memorable cry of 'Liberty, Property, and no Excise,' compelled Walpole to abandon his project.

EXCISE.

An excise, compared with other taxes, has its good and its bad features: it is a method of extracting money for national purposes from personal expenditure on luxuries, and is especially serviceable when fed from those luxuries the use of which in excess becomes a vice. On the other hand, it renders necessary a system of inquisitorial inspection not only very offensive to all free people, but very open to abuse and fraud; while at the same time excessively high duties, and duties on commodities strictly of domestic manufacture, lead to smuggling and all its demoralizing consequences. The evils of an excise were formerly aggravated by the practice of farming the duties—that is, by letting them to the highest bidder, whose interest it became, like any other contractor, to make the greatest possible profit by his speculation, and consequently to exact the duties in the most rigorous manner. In every well-regulated revenue system, it is of course only fair to all parties that the duty as the law lays it on should be fully exacted; but in the age of farming, the arrangements were all slovenly, and there was much latitude of power in the hands of the farmers. The farming system became very oppressive in France, especially in the *gabelle* or excise on that necessary of life, salt. It is a curious fact, however, that when the farming of the excise was abolished in Scotland by the Union, the people grumbled, saying they were easier under the farmers, their own neighbors, who acted on the principle of 'live and let live,' than under the officers sent from England, who rigidly collected the impost.

An excise works most easily when it is laid on some commodity not of domestic production, but created by manufacturers on a large scale. In a great distillery, the excise officer is almost a portion of the establishment, who has an eye on every step of the process, with the view of seeing that the commodity does not go into the market without government obtaining its proper share—sometimes far the greater part—of the market price. The social influence of such an arrangement is very different from that of the old candle and salt duties, which made it the function of the exciseman to pounce on a farmer's family melting the surplus tallow of the last killed sheep, or of a fisherman boiling sea-water to procure salt for his potatoes. The manufacturer, however, though he has the benefit of the bonding system, feels the excise regulations as a perpetual drag and hindrance in his operations, since there are multitudes of minute operations which he cannot perform without sending special notice to the excise department, or having an officer actually present. This renders it necessary, too, that all the steps of the process should not merely be defined as between the manufacturer and the officer, but should be set forth in an act of parliament; and hence deviations for the

purpose of economy, or by way of experiment, become difficult, and sometimes impracticable. As difficulties with which the producer has to contend, these things require him to lay on the selling price of the commodity a larger addition, by reason of the excise, than the actual amount of the duty.

No method of taxation requires a nicer adjustment to the social condition of a country than an excise. Thus, in England, in 1746, a duty of 20*s.* a gallon was laid on spirits, with the view of suppressing the vice of drunkenness, which, on the other hand, it greatly increased, for the law became a dead letter, and the smuggler fully supplied the market, though within the two years in which the law was in force, no fewer than 12,000 persons were, according to Tindal's History, convicted of offenses against the act. In Scotland, the duty, which was 5*s.* 6*d.* a gallon, had to be reduced in 1823 to 2*s.*, on account of the prevalence of smuggling —half the consumption of the country, in fact, paying no duty. The duty has since then been gradually raised, until it now amounts to 10*s.* a gallon, forming a vast source of revenue. The productiveness of this great source of revenue, and the expense connected with the levying of a duty on other commodities, has led to the gradual removal of many excise duties, as, for instance, on salt, candles, leather, glass, soap, paper, and race-horses. The malt-tax was transferred to beer 1880. In 1849, the excise department was amalgamated with that of stamps and taxes to form the Board of Inland Revenue; and many changes have been made both as to the articles taxable, and on the organization of the excise system. The only articles on which excise duties are now charged are spirits, beer, chicory, and the passenger receipts of railway companies. But various taxes of the nature of license-duties for following particular pursuits are collected in the excise department; also several items chargeable before 1869 as assessed taxes. License-duties must be taken out yearly by auctioneers, appraisers, brewers, malsters, distillers, makers of vinegar, victuallers, sellers of beer, spirits, and wine, sellers of playing-cards if also makers, hawkers, horse-dealers, house-agents, tobacconists, pawnbrokers, dealers in sweets, and dealers in patent medicines. Game-licenses, gun-licenses, and licenses for male-servants, horses, dogs, carriages, and the use of armorial bearings, come under the same department. According to the present organization of the excise department, the United Kingdom is divided into collections, each under a collector; the collections are subdivided into districts, each under a supervisor; and these into divisions, each under division-officers and ride-officers. The efficiency with which these officials discharge their duties secures a very complete payment of taxes, and their manner of dealing with the tax-payers leaves a *minimum* of just ground for complaint.

In the United States, the word excise is little used except in reference to a tax on the sale of intoxicating liquor. The long struggle of the English people against excise was not due to any intrinsic iniquity in the tax, but partly to popular dislike of all direct taxes (see CUSTOMS; TARIFF); partly to the inquisitorial methods involved, partly to their use as a means of strengthening the royal power against popular control. At any rate, the colonists inherited this unreasoned dislike, even under totally different conditions; though Connecticut had laid an excise on spirits and all use of foreign articles, and Massachusetts and Pennsylvania on spirits, before the Revolution. But all shrank from giving the national government such power, and several States proposed amendments to the Constitution forbidding the United States ever to lay excises. Hamilton, however, recommended to Congress in 1790 an excise on spirits, upon the most advanced modern grounds—that it would not only produce a revenue without burdening any worthy industry or person, but would check the consumption, to the great advantage of the community. With great opposition the law was passed, imposing a duty of 9 to 25 cents a gallon (according to strength) on all native spirits, and a higher one on imported. In 1792 the tax was lowered somewhat. Later, under Hamilton's advisement, the scope was extended to other articles of luxury, auction sales, stamp duties on instruments of exchange, etc. But it was nullified in some sections by passive resistance; at last in 1794 a furious open defiance began in Pennsylvania (see WHISKEY INSURRECTION), which had to be quelled by the regular army. There was no further resistance, but no cessation of the dislike, which was naturally a Democratic tenet, from the power it gave the general government; and when Jefferson became President, on his recommendation Congress abolished the entire system, which was possible from the large increase in customs receipts. The War of 1812, however, necessitated a fresh resort to it; and duties were laid on spirits (license tax), and the same articles Hamilton had chosen—sugar, carriages, auctions, and exchanges—with salt added. They were repealed in December 1817, and no further excises were levied till the system of internal revenue taxes (q.v.) was adopted in 1862.

EXCISION, n. *ĕk-sĭzh'ŭn* [F. *excision*—from L. *exeisĭōnem*, destruction: L. *excīsus*, cut out or off (see EXCISE)]: a cutting out or off; amputation: destruction.

EXCITE, v. *ĕk-sīt'* [F. *exciter*—from L. *excĭtārĕ*, to rouse up—from *ex*, out of; *cĭto*, I call or summon: It. *eceitare*]: to call into action; to rouse; to animate; to stimulate; to inflame; to raise or stir up. EXCI'TING, imp.: ADJ. calling or rousing into action; stimulating. EXCI'TED, pp.: ADJ. roused; awakened; animated. EX-

CI'TER, n. one who. EXCI'TABLE, a. *-sī-tă-bl* [F.—L.]: easily provoked or called into action. EXCI'TABIL'ITY, n. *-bĭl'ĭ-tĭ*, the being easily provoked or called into action. EXCITE'MENT, n. *-sīt'mĕnt*, state of being excited; agitation; that which excites. EX'CITANT, a. *-sĭ-tănt* [F.—L.]: that which produces or is capable of producing increased action; in *med.*, excitants are stimulants, pharmaceutical preparations which, acting through the nervous system, tend to increase the action of the heart and other organs. They all have a pungent and acrid taste and give rise to a sensation of warmth when placed on a tender part of the skin. The class is very numerous; and the application should be under the supervision of a qualified medical practitioner. EXCI'TATIVE, a. *-sī'tă-tĭv*, having power to excite. EX'CITA'TION, n. *-sĭ-tā'shŭn* [F.—L.]: the act of exciting. EXCI'TATORY, a. *-tėr-ĭ*, tending to excite. EXCI'TINGLY, ad. *-lĭ*. EXCITO MOTOR ACTION: see NERVOUS SYSTEM. EXCITING-CAUSES, n. in *med.*, causes which tend immediately to produce disease, as distinguished from predisposing causes, which during long periods of time prepare the way for it to arise. EXCITO-MOTORY, a., in *anat.*, the function of the nervous system by which an impression is transmitted to a centre and reflected so as to produce contraction of a muscle without sensation or volition.—SYN. of 'excite': to incite; awaken; arouse; irritate; provoke; kindle; stir up; agitate.

EXCITER. A small continuous current dynamo for supplying current to magnetize the field windings of alternating current dynamos or motors.

EXCLAIM, v. *ĕks-klām'* [OF. *exclamer*— from L. *exclamārĕ*, to cry aloud—from *ex*, out of; *clāmō*, I cry: It. *esclamare*]: to cry out loudly; to speak or utter emphatically; to make a loud outcry in words: N. in *OE.*, clamor; outcry. EXCLAIM'ING, imp. EXCLAIMED', pp. *-klāmd'*. EXCLAIM'ER, n. one who. EX'CLAMA'TION, n. *-klă-mā'shŭn* [F.—L.]: outcry; a loud noise in words; vehement utterance; the point or mark (!) put after words expressing emphatic speech or wonderment. EXCLAM'ATIVE, a. *-klăm'ă-tĭv*, containing exclamation. EXCLAM'ATORY, a. *-tėr-ĭ*, expressing exclamation.—SYN. of 'exclamation': clamor; cry; uproar; acclamation; tumult; bawling; shouting; vociferation; utterance.

EXCLAVE, n. *ĕks'klāv* [L. *ex*, out; *clavis*, key]: portion of a country separated from the main part.

EXCLUDE, v. *ĕks-klôd'* [L. *exclūdĕrĕ*, to shut out, to exclude—from *ex*, out of; *claudo*, I shut: It. *escludere*: F. *exclure*]: to hinder from entering; to shut out; to debar; to prohibit; to except. EXCLU'DING, imp. EXCLU'DED, pp. EXCLU'SION, n. *-klô'zhŭn* [F. *exclusion*—from L. *exclūsiōnĕm*—from *clausus*, closed, shut]: the act of shutting out; the act of debarring; rejection; exception. EXCLU'SIONARY, a. *-ėr-ĭ*, tending to exclude or debar. EXCLU'SIONIST, n. one who would debar an-

other from any right or privilege. EXCLU'SIVE, a. *-klô'sĭv,* tending to exclude; having the power to exclude; not admitting to social intercourse; illiberal; not taking into the account; not including. AN EXCLUSIVE, one whose real or affected fastidiousness makes his circle of acquaintance more than ordinarily select. EXCLU'SIVELY, ad. *-lĭ.* EXCLU'SIVENESS, n.—SYN. of 'exclude': to forbid; deprive; hinder; disqualify; preclude; thrust out; eject.

EXCLUDED MIDDLE: See DIVISION.

EXCLU'SION BILL: proposed measure for excluding the Duke of York, afterward James II., from the succession to the English throne, on account of his avowed Rom. Catholicism. A bill to this effect passed the commons 1679, but was thrown out by the upper house. As the new parliament summoned 1681 seemed determined to revert to this measure, it was dissolved, and Charles ruled henceforth without control. See CHARLES II: JAMES II.

EXCOGITATE, v. *čks-kŏj'ĭ-tāt* [L. *excōgĭtātus,* found out by thinking, devised—from *cx,* out of; *cōgĭtō,* I think]: to invent or contrive; to strike out by thinking. EXCOG'ITATING, imp. EXCOG'ITATED, pp. EXCOG'ITA'TION, n. *-tā'shŭn,* invention or contrivance by thinking.

EXCOMMUNICATE, v. *čks'kŏm-mū'nĭ-kāt* [L. *excommunĭcātus,* put out of a community—from *ex,* out of; *commūnĭcātus,* having anything in common with one: It. *communicare;* F. *communiquer,* to impart]: to expel or exclude from the communion of the church; to deprive of church privileges: N. one who is excluded from the fellowship of the church: ADJ. excluded from church privileges. EX'COMMU'NICATING, imp. EX'COMMU'NICATED, pp.: ADJ. expelled or separated from communion with a church. EX'COMMUNICA'TION, n. *-kā'shŭn* [F.—L.]: act of expelling from the communion of a church; deprivation of church privileges; withdrawal of Christian fellowship by a church. The ancient Romans had something analogous in the exclusion of persons from the temples and from participation of the sacrifices, which persons were also given over with awful ceremonies to the Furies. The Mosiac Law decreed excommunication in case of certain offenses; and the intimate connection of things civil and ecclesiastical under the Jewish polity, rendered it terrible even as a temporal punishment. The Jews, in practice, had three degrees of excommunication. The first, *Niddui,* was an exclusion from the synagogue for 30 days, that the offender might be ashamed. The second, *Cherem,* also was for 30 days, but beside exclusion from the synagogue, carried with it a prohibition to all other Jews of any intercourse with the individual, and was often proclaimed with sound of trumpet. The third, *Shammatha* or *Anathema Maranatha* (see I Cor. xvi. 22), was exclusion from the synagogue and privileges of the Jewish Church for

life, with loss of civil rights, and was accompanied with terrible curses, in which the offender was given over to the judgment of God. In the Christian Church, excommunication has in all ages been practiced, as indeed every society must necessarily have the power of excluding unworthy members and those who refuse to comply with its rules, and the New Testament plainly recognises and establishes this right in the church. But two different degrees of excommunication were soon distinguished—the first or lesser, a mere exclusion from the Lord's Table and from other privileges of members of the church; the second or greater, pronounced on obstinate offenders and persons who departed into deadly errors of doctrine, more solemn and awful, and not so easily capable of being revoked. Penances and public professions of repentance were required; and in Africa and Spain, the absolution of *lapsed* persons (i.e., those who in time of persecution had yielded to the force of temptation, and fallen away from their Christian profession by the crime of actual sacrifice to idols) was forbidden, except at the hour of death, or in cases where martyrs interceded for them. But for a long time, no civil consequences were connected with excommunication. Afterward, the greater excommunication was accompanied with loss of political rights, and exclusion from public offices. The power of excommunication also, which had been at first in the church as a body, gradually passed into the hands of the bishops, and especially of the popes, who did not scruple to exercise it against entire communities at once. The *capitularies* of Pepin the Less, in the 8th c., ordained that the greater excommunication should be followed by banishment from the country. The Roman Cath. Church pronounces the sentence of excommunication with many circumstances of terrible solemnity, and it contains a prohibition to all Christian persons of all intercourse with the person excommunicated, and of extending to him even the most ordinary social offices. The latest 'examples' made by the pope were Napoleon 1. 1809, and Victor Emmanuel, King of Italy, 1860, neither of whom, however, was excommunicated by name, the pope having confined himself to a solemn and reiterated publication of the penalties decreed by his predecessors against those who unjustly invaded the territories of the Holy See, usurped or violated its rights, or violently impeded their free exercise. Pope Innocent III., in the Lateran Council (1215), declared that excommunication put an end to all civil rights and dignities, and to the possession of any property. The excommunication of a sovereign was regarded as freeing subjects from their allegiance, and in 1102, this sentence was pronounced against Emperor Henry IV., an example which subsequent popes ventured to follow. But the fearful weapons with which the popes armed themselves in this power of excommunication, were rendered much less effective through

their incautious employment, the evident worldly motives by which it was sometimes governed, and the excommunications which rival popes hurled against each other during the time of the great papal schism. The Greek Church also makes use of excommunication, and every year at Constantinople, on a certain Sunday, the greater ban is pronounced against the Rom. Cath. Church.—The Reformers retained only that power of excommunication which appeared to them inherent in the constitution of the Christian society, and to be sanctioned by the New Testament; nor have any civil consequences been generally connected with it in Prot. countries. To connect such consequences with excommunication in any measure whatever, is certainly inconsistent with the principles of the Reformation. Nevertheless, in England, until the 53d of Geo. III. c. 127, and in Ireland, until the 54th, c. 68, persons excommunicated were debarred from bringing or maintaining actions, from serving as jurymen, from appearing as witnesses in any cause, and from practicing as attorneys in any of the courts of the realm. All these disabilities were removed by the statutes above named; and the excommmnicated were declared no longer liable to any penalty, except 'such imprisonment, not exceeding six months, as the court pronouncing or declaring such person excommunicate shall direct.'

In the Rom. Cath. Church, the power of excommunicating is held to reside, not in the congregation, but in the bishop; and this is believed to be in exact accordance with the remarkable proceeding commemorated I Cor. v. 3–5, and with all the earliest recorded examples of its exercise. Like all the other powers of the episcopate, it is held to belong, in an especial and eminent degree, to the Roman bishop, as primate of the church; but it is not thought to belong to him exclusively, nor has such exclusive right ever been claimed by the bishops of Rome. On the contrary, bishops within their sees, archbishops while exercising visitatorial jurisdiction, heads of religious orders within their own communities, all possess the power to issue excommunication, not only by the ancient law of the church, but also by the most modern discipline. As to the prohibition of intercourse with the excommunicated, a wide distinction is made between those who are called 'tolerated' and those who are 'not tolerated.' Only in the case of the latter (a case extremely rare, and confined to heresiarchs, and other signal offenders against the faith or public order of the church) is the ancient and scriptural prohibition of intercourse enforced. With the 'tolerated,' since the celebrated decree of Pope Martin V. in the Council of Constance, the faithful are permitted to maintain the ordinary interconrse. It is a mistake, likewise, to ascribe to Rom. Catholics the doctrine, 'that excommunication may be pronounced against the dead.' The contrary is expressly laid down by all

canonists (Liguori, *Theologia Moralis*, lib. vii. n. 13, 1). In the cases in which this is said to have been done, the supposed 'excommunication of the dead' was merely a declaration that the deceased individual had, *while living*, been guilty of some crime to which *excommunication is attached by the church laws*. Rom. Cath. writers, moreover, explain that the civil effects of excommunication in the mediæval period—such as incapacity to exercise political rights, and even forfeiture of the allegiance of subjects—were annexed thereunto by the civil law itself, or at least by a common international understanding in that age. Examples are alleged in the law of Spain, as laid down in the Sixth Council of Toledo—a mixed civil and ecclesiastical congress—(638); in the law of France, as admitted by Charles le Chauve (859); in the Saxon and in the Swabian codes; and even in the English laws of Edward the Confessor; all which, and many similar laws, proceed on the great general principle of these mediæval monarchies, viz., that orthodoxy and communion with the Holy See were a necessary condition of the tenure of supreme civil power; just as by the 1 Will. and Mary, s. 2, c. 2, profession of Protestantism is made the condition of succession to the throne of England. Hence, it is argued, the mediæval popes, in excommunicating sovereigns, and declaring their subjects released from allegiance, did but declare what was, by the public law of the period, the *civil* effect of the exercise of what in them was a *spiritual* authority. By the discipline of the Rom. Cath. Church, kings or queens, and their children are not included in any general sentence of excommunication, unless they be specially named.

The lowest and simplest form of excommunication—the only form recognized by some opponents of ecclesiasticism—is merely a withdrawal of Christian fellowship, pronounced by a church acting not as a court but as a brotherhood. It is intended not as a *penalty*, but as a protection to the church, and as a warning to the offender with a view to his reclamation.

EXCORIATE, v. *ĕks-kō′rĭ-āt* [L. *excŏrĭātus*, having stripped off skin—from *ex*, out of; *cŏrĭŭm*; Gr. *chorĭŏn*, skin, hide: F. *excorier*]: to wear or strip off the skin; to break the skin by rubbing; to gall or abrade. EXCO′RIAT′ING, imp. EXCO′RIATED, pp. EXCO′RIA′TION, n. *-ā′shŭn* [F.—L.]: the act of wearing or rubbing off the skin; an abrasion.

EXCORTICATION, n. *ĕks-kŏr′tĭ-kā′shŭn* [F. *excortication*—from L. *ex*, out of; *cortex* or *cortĭccm*, bark] the act of striping off bark. EXCOR′TICATED, a. stripped of the bark.

EXCREMENT, n. *ĕks′krĕ-mĕnt* [F. *excrément*—from L. *excrēmĕntum*, that which passes from the body—from *ex*, out off; *crētus*, separated: It. *escremento*]: matter discharged from an animal body after digestion; dung;

filth. Ex'CREMENTAL, a. *-tăl*, discharged or voided as excrements. Ex'CREMENTIT'IOUS, a. *-mĕn-tĭsh'ŭs*, pertaining to or consisting of matter voided from the animal body.

EXCREMENT: Food consists, in general, of two clases, the carbo-hydrates and fats, composed of carbon, hydrogen and oxygen, and the proteids, containing, in addition to the above three elements, nitrogen. The other constituents which are present in very small quantity, may, for our present purpose be ignored. In the case of most animals the waste material resulting from the former class of foods is voided through the bowels, whereas the nitrogenous matter is largely execreted in the urine and, to a less extent in the perspiration. A healthy man execretes daily about 4 oz. of fæces, containing, approximately, 26.7 per cent. of dry solid matter. This latter consists of undigested food, especially of vegetable matter, together with considerable quantities of fatty material, of acids, resinous substances, sand and bodies derived from the bile. Bile itself is present only in special circumstances, as in cases of diarrhœa. The characteristic odor of human fæces is chiefly derived from scatole which, chemically, is not very distantly related to indigo. Most of the nitrogenous material is eliminated in the urine as urea, NH_2CONH_2; a small quantity of uric acid, in combination, is also present. It should be noted that the quantity of urea produced depends necessarily, in the last resort, on the nature and quantity of the food consumed and, of course, this differs largely according to the age, sex, occupation and habits of the individual. In cases of disease the execreta often undergo very marked and characteristic change, and contain many substances which are absent from normal products or which are present in them only in minute quantities. Thus healthy urine contains, at the most, only traces of grape sugar and albumin, but that voided by people suffering from diabetis contains very large amounts of this sugar and has a characteristic odor of new mown hay, while the presence of albumin in relatively large amounts is characteristic of certain kidney diseases. The color of urine and the deposition by it of a sediment on standing are, in themselves, of no pathological significance. As regards mineral matter, sodium chloride is present in the urine, which also contains sulphates and phosphates of calcium, magnesium, etc. Herbiverous animals execrete their nitrogenous matter chiefly as hippuric acid (benzoylaminoacetic acid $C_6H_5CONHCH_2CO_2H$ instead of urea. Birds and reptiles void all their waste products simultaneously, the nitrogen being eliminated mostly as uric acid, which forms the white portion of the excreta. For an account of the numerous compounds which occur in excrement in very small quantity, or only in special circumstances, reference must be

made to medical works dealing particularly with this subject.

EXCRESCENCE, n. *ĕks-krĕs′ĕns* [OF. *excrescence*, an excrescence: L. *excrĕscĕntĭă*, morbid excrescences on the body—from *ex*, out of; *crescens* or *crescen′tem*, growing: It. *escrescenza:* F. *excroissance*]: a protruberance or growth on any body; an outgrowth; a superfluity. EXCRES′CENT, a. *-ĕnt*, growing out of, as a superfluity. EXCRESCENT CONSONANTS, term introduced by Prof. Key to designate what before was called Epenthesis.

EXCRETE, v. *ĕks-krēt′* [L. *excrētus*, sifted out, separated (see EXCREMENT]: to separate and throw off; to discharge from the body; to strain out. EXCRE′TING, imp. EXCRE′TED, pp. EXCRE′TION, n. *-krē′shŭn* [F.—L.]: a throwing off of void matter from an animal body; any matter excreted. EXCRETA, n. plu. *ĕks-krē′tă*, waste matter discharged from the body, especially discharges from the bowels. EXCRETIN, n. *ĕks′-krĕ-tĭn*, a crystalline slightly alkaline substance said to be found in fresh nightsoil or excreta. EXCRE′TIVE, a. *-tĭv*, having the power to eject certain matter from the body. EXCRE′TORY, a. *-tėr-ĭ* having the power to excrete: N. a duct or vessel which conveys secreted fluid from a gland. EXCRETOLIC, a. *ĕks-krē′tŏ-lĭk*, denoting an acid said to be obtained from fresh nightsoil. EXCRETORY ORGANS, n. in *anat.*, the organs by which excretion takes place; specifically, the skin, the lungs, and the kidneys.

EXCRIPT, n. *ĕks′krĭpt* [L. *excriptus*, pp. of *excribo*, I write out]: in *law*, a copy, a writing copied from another.

EXCRUCIATE, v. *ĕks-krô′shĭ-āt* [L. *excrŭcĭātus*, tortured greatly—from *ex*, out of, very much; *crŭcĭātus*, tortured—from *crux*, a cross]: to torment; to torture; to inflict severe pain on. EXCRU′CIATING, imp.: ADJ. extremely painful; agonizing. EXCRU′CIATED, pp. EXCRU′CIA′TION, n. *-ā′shŭn*, extreme pain; torture.

EXCUBITORIUM, n. *ĕks-kū-bĭ-tō′rĭ-ŭm*, [L. from *excubo*]: in *arch.*, a gallery or loft in a church where watch was kept at night on the eve of any great festival, and from which the great shrines were observed.

EXCUDIT, v. *ĕks-kū′dĭt* [L.—from *excudo*, I engrave]: he engraved it; word placed at the bottom of an engraving, preceded by the name of the engraver.

EXCULPATE, v. *ĕks-kŭl′pāt* [L. *exculpātus*, cleared of blame—from *ex*, out of; *culpă*, blame: It. *colpare*, to blame, to censure]: to clear by an explanation from the charge of a fault or of guilt; to excuse; to clear from blame; to justify; to exonorate. EXCUL′PATING, imp. EXCUL′PATED, pp. EX′CULPA′TION, n. *-pā′shŭn*, the act

of vindicating from the charge of a fault or crime; an excuse. EXCUL'PATORY, a. *-pă'tėr-ĭ,* clearing from the charge of a fault. LETTERS OF EXCULPATION, in the *law of Scotland,* warrants granted to the accused person in a criminal prosecution, to enable him to cite and compel the attendance of witnesses.

EXCURRENT, n. *ĕks-kŭr'rĕnt* [L. *ex,* out of; *currentem,* running]: in *bot.,* running out beyond the edge or point; applied to the central stem of a tree with the branches surrounding it in regular order, as in a fir tree.

EXCURSION, n. *ĕks-kėr'shŭn* [F. *excursion*—from L. *exeursĭōnem,* a running out or forth—from *ex,* out of; *eursus,* a running: It. *escursione*]: a pleasure-trip; a short tour; a ramble; a digression; a wandering from the subject or main design. EXCUR'SIONIST, n. *-shŭn-ĭst,* one travelling to a place for pleasure. EXCUR'SIVE, a. *-sĭv,* rambling; wandering. EXCUR'SIVELY, ad. *-lĭ.* EXCUR'SIVENESS, n. the act of wandering. EXCURSUS, n. *ĕks-kėrs'ŭs* [L. a running out or forth]: added notes containing additional information on certain points; a digression; a less formal dissertation.—SYN. of 'excursion'; tour; jaunt; journey; expedition; trip.

EXCUSE, n. *ĕks-kūs'* [F. *excuse,* an excuse; *excuser,* to excuse—from L. *excusārĕ,* to free from blame—from *ex,* out of; *eusa,* a cause, a suit; It. *eseusare*]: that which excuses or justifies; a plea offered in extenuation of a fault; an apology; a pretext: V. *ĕks-kūz',* to pardon; to overlook on receiving an explanation or apology; to disengage or free from an obligation; to justify. EXCU'SING, imp. EXCUSED, pp. *-kūzd'.* EXCU'SER, n. *-kū'zėr,* one who. EXCU'SABLE, a. *-zŭ-bl,* pardonable; admitting of excuse. EXCU'SABLY, ad. *-blĭ.* EXCU'SABLENESS, n. -bl-nĕs, the state of being excusable. EXCU'SATORY, a. *-tėr'ĭ,* containing an excuse or apology. EXCUSE'LESS, a. *-kūs'lĕs,* that for which no excuse or apology can be offered.—SYN. of 'excuse, n.': justification; exculpation; defense; plea; pretense; release; acquittal; absolution;—of 'excuse, v.': to acquit; free; release; exculpate; absolve; forgive; overlook; remit; relieve.

EXE, *ĕks:* river of the s.w. of England; rising in Exmoor, in the w. of Somersetshire, flowing 19 m. s.e. to the borders of Devonshire, and then 35 m. s. through the e. part of that country into the English Channel at Exmouth. The lower five miles form a tideway a mile broad at high water, with wooded and picturesque shores, and navigable for large vessels. The chief tributaries are the Barle, 24 m. long, Batham, Loman, Culm, and Creedy. The Exe passes Dulverton, Brompton, Exeter, and Topsham. It has a clear and merry current through wooded and romantic vales.

EXEAT, n. *ĕks'ĕ-ăt* [L. *exĕăt,* let him go out—

from *ex*, out of; *ĕō*, I go]: a bishop's permission to a priest to leave his diocese; permission to a student to leave his residence in his college.

EXECRATE, v, *ĕks'ĕ-krāt* [L. *exsĕcrātus*, accursed—from *cx*, out of; *sācrō*, I devote or doom to destruction: It. *csccrare:* F. *exécrer*, to execrate]: to detest utterly; to abominate; to denounce evil against; to curse. EX'ECRATING, imp. EX'ECRATED, pp. cursed; denounced. EX'ECRABLE, a. *-kră-bl* [F.—L.] very hateful; detestable. EX'ECRABLY, ad. *-blĭ*. EX'ECRA'TION, n. *-krā'shŭn* [F.—L.]: the expression of utter detestation; imprecation of evil.

EXECUTE, v. *ĕks'ĕ-kūt* [F. *exécuter*—from L. *exsĕcūtŭs*, followed to the end—from *ex*, out of; *secūtŭs*, followed]: to carry into complete effect; to perform; to inflict; to put to death by form of law; to complete, as a legal document. EX'ECU'TING, imp. EX'ECUTED, pp. EXEC'UTANT, n. *-tant*, one who performs; a performer, as an *executant* on the piano. EXECUTOR, n. *ĕks'ĕkū-tĕr*, one who performs or does a thing; in *OE.*, one who inflicts the punishment of death; an executioner. EX'ECU'TION, n. *-kū'shŭn* [F.—L.]: performance; mode of performing or carrying into effect; a legal warrant or order; signing of a deed; capital punishment; destruction; effect produced: in the *law of Scotland*, attestation by a messenger-at-arms (q.v.), or other officer of the law, that he has given a citation, or carried through a diligence (q.v.), in terms of the warrant of the judge. It corresponds to an affidavit of service of writ or summons in the common-law courts, and of a bill or claim in chancery; see EVIDENCE. EX'ECU'TIONER, n. *-shŭn-ĕr*, he who puts to death by legal warrant; a hangman (see CAPITAL PUNISHMENT). *Military and Naval Executions* are usually by either hanging or shooting: see PUNISHMENTS, MILITARY AND NAVAL: MUTINY ACT. EXECUTIVE, n. *ĕgz-ĕk'ū-tĭv*, the person or body in the administration of a country who puts the laws in force—thus distinguished from the legislative and judicial bodies; the governing person or body (see ADMINISTRATION, in Politics: EXCUTIVE DEPARTMENT: GOVERNMENT): ADJ. pertaining to the governing body; having the power to put the laws in force; not legislative or judicial; active. EXEC'UTIVELY, ad. *-lĭ*. EXEC'UTOR, n. *-tĕr*, a person appointed by a testator to carry out his will. EXEC'UTRIX, n. *-trĭks*, a woman so appointed. EXEC'UTORSHIP, n. the office of an executor. EXECUTRY, n. *ĕgs,-ĕk'ū-trĭ*, in *Scotch law*, general name for all the movable estate and effects of a deceased person (except the heirship movables), being the proper subject of the executor's administration. EXEC'UTO'RIAL, a. *-tō'rĭ-ăl*, pertaining to an executor. EXEC'UTORY, a. *-tĕr-ĭ*, performing official duties; having authority to put the laws in force. EXECUTABLE, a. *ĕgz-ĕk'ū-tă-bl*, capable

of being accomplished, feasible. EXECUTOR DATIVE, *ĕgz-ĕk′ū-tẽr* [*dative*, given or assigned—from L. *datus*, given]: in *Scot.*, an officer or executor appointed to administer a deceasd intestate's movable estate in behalf of all concerned. EXECUTOR DE SON TORT, in *law*, 'if a stranger takes upon him to act as *executor*, without any just authority, as by intermeddling with the goods of the deceased, and many other transactions, he is called in law an *executor* of his own wrong, *de son tort*, and is liable to all the trouble of an executorship; but merely locking up the goods, or burying the corpse of the deceased, will not amount to such an intermeddling as will charge a man as *executor* of his own wrong.'—*Blackstone*. EXECUTOR NOMINATE, the person appointed by deceased.—SYN. of 'execute': to accomplish; effect; achieve; fulfill; consummate; finish.

EXECU'TION, in law, the carrying into effect the final judgment, decree, or order of the court. Execution is effected by a writ or order directed to the proper officer and commanding him to do a certain thing. In civil law it is the means of obtaining that which the court ordered to be done by one of the parties. Execution may be had for either plaintiff or defendant. When taken out by the plaintiff it depends on the cause of action as to what is to be recovered under the writ; generally it is for the debt and costs, or for the goods, damages, and costs. When taken out by the defendant it may be for goods, damages, and costs, and in some cases it may be only for costs.

As soon as final judgment has been entered, the party entitled to it may take out his writ of execution, and he is entitled to this writ until the other party has taken some step which is a *supersedeas*, such as an appeal or writ of error. The writ issues from the court which last passed on the judgment on which the writ of execution is taken out. Execution may be against personal property, taking and selling it, or it may be against real estate, either holding it until the judgment is paid, or selling it, or in some cases by the seizure, of the person of the defendant and holding him until the judgment is satisfied, or until he is declared insolvent. If the property is sold the fund derived from the sale is applied to the paying the judgment and costs, and the surplus, if any, is returned to the former owner of the goods. A writ of execution, although issued at the instance of the party in whose favor the judgment is, must be directed to the sheriff, who must carry out the direction of the writ. If he fails to do so he must answer in damages to the injured party. When the execution is against personal property, such as goods and chattels, the writ of *fieri facias* is used. When the personal property consists of choses in action it is reached by a writ of attachment. If the execution is against real estate a writ

of *scire facias* is used, and it is sold under a writ of *venditioni exponas*. In some cases, when the judgment is confined to a particular piece of real estate, the writ of *levari facias* is issued first, and it is sold under a writ of *venditioni exponas*. If the execution is against the person of the defendant a writ of *capias ad satisfaciendum* is issued, under which the defendant is arrested, and his person held until the judgment is satisfied, or until the defendant is declared insolvent. Sometimes the defendant is released if security is given that the defendant will abide by the order of the court.

A general judgment binds all property owned by the person against whom the judgment is recovered at the time the judgment is entered, and it also attaches to all property he acquires up to the time the judgment is satisfied, and if the debtor sells any real estate before the judgment is satisfied, the property is not released from the lien of the judgment. When property is sold under an execution the purchaser only buys the title of the debtor, and all equities under which he held it still attach to the property.

In the criminal law execution is the carrying into effect the judgment of the court in relation to the person convicted. It consists in putting the convict to death according to his sentence. See CAPITAL PUNISHMENT.

EXECU'TIONER: the official who executes the sentence of capital punishment. (It is common, and convenient, to speak of him as executing the criminal: strictly, it is the *sentence* or the penalty that he executes). In England, and in the United States, it is the province of the sheriff to perform this as well as every other ministerial duty enjoined by the criminal courts, but practically he acts by his servants or officers, and he only attends to see the law properly carried out. In royal burghs in Scotland, this duty is imposed on the civic magistracy, one of whom attends for the purpose. In former times so numerous were the public executions in Britain, that almost every county and town had its executioner, as an acknowledged officer of justice, with a salary for his subsistence. Yet, we learn that on certain occasions, so odious and so onerous was the duty to be performed, that a special executioner was employed.

Like many other offices, that of executioner seems to have been at one time hereditary in England. Shakespeare in *Coriolanus* (act. ii. scene 1), makes Menenius, one of the characters in the play, speak of 'hereditary hangmen.' In several German states, the office of Headsman (q.v.) also is said to have been hereditary; certain families being thus, as it were, condemned to perpetual infamy. The last headsman of the Tower of London died 1861. The office was latterly a mere sinecure, and has not been filled. In some parts of Eng-

land, the office was annexed to other posts; for instance, the porter of the city of Canterbury was executioner for the county of Kent, in the time of Henry II. and Henry III., for which he had an allowance of 20*s.* per annum from the sheriff, who was reimbursed by the Exchequer. The sum of thirteenpence halfpenny was long popularly spoken of as 'hangman's wages;' such sum, equal to a merk Scots, being the fee at one time paid to the executioner when he officiated. In the 17th c., this sum, small as it now appears, was considerably above the wages of a skilled mechanic.

No professional executioner is employed at capital punishments in the United States. Here the sentence is executed by the sheriff, with the assistance of an under-jailer; this last official performing the fatal toilet of the criminal, while the sheriff, by a movement affecting the drop, puts him to death in virtue of the sentence and the law of the State. In New York state, the warden of the penitentiary is technically the executioner, but the duties are usually performed by one of his assistants. This seems an advance on the practice in England, where, however, it could not be introduced, for the reason, that the sheriff there being a magistrate, no one fit for the rank of sheriff or magistrate would accept of office with an obligation to perform the duty of executioner in person. The military executioner attached to an army is styled provost-marshal (q.v.)

EXEC'UTIVE, in the United States, properly the entire official body charged with the execution of the laws, from the head to the lowest subordinate; but in current use, restricted to the head officer, as President (of the United States), governor (of a State), mayor (of a city), etc. (See CABINET.) The general executive of the colonies was the king; their individual executives, the governors, appointed by the crown or (in Rhode Island and Connecticut, and for a few years in Massachusetts) chosen by the people. These were succeeded *de facto* by the committees or councils of safety; then by officials usually called governor, sometimes president, and sometimes not by single persons, but by executive councils as in Switzerland. The general government had no executive till the adoption of the Constitution. The Continental Congress had only such functions as the State legislatures allowed it, which were to debate and ask for supplies and make recommendations, and the Articles of Confederation provided for no executive. The Constitution, although it gives the President large executive powers, compels him to share the most important, as appointments and treaties, with the Senate; it was only after debate, indeed, that a single executive was resolved on, there being a strong sentiment in favor of a plural executive representing different sections of the Union, and three

States voted in favor of the latter in committee of the whole. The question of succession of executive power in case of the death or disablement of the chosen executive has been elaborately provided for by statute; in case of the President, first by succession of the Vice-President, then by a series of devolutions upon the various officers of the Cabinet, beginning with the secretary of state — so that nothing but a successful Gunpowder Plot, or rather a number of simultaneous ones, could paralyze national executive authority. The embarrassing cases of possible lunacy, paralysis, etc., have never arisen, nor has capture by the enemy; though the latter has twice been imminent—of Madison by the British in 1814, of Lincoln by Booth (the original plan) in 1865. But cases which have not occurred in 114 years may be left to deal with when they do occur. The executive departments were first created in 1781—Foreign Affairs, Finance, War, and Marine; previously, their work had been done by Congressional committees, or commissions appointed by them. They were reorganized in 1790.

EXECUTOR OF A WILL: the person to whom, by the testator's own appointment, has been committed the execution of a last will and testament. If the person is a woman she is styled 'executrix.' Where a person dies without having left a will, or has left a will but appointed no Executor, or an Executor has been appointed who is incapable of acting as such, or who refuses to act, or has acted but partially, an administrator may be appointed by a court, having jurisdiction of probate matters. The Executor is said to derive his authority from the will, while the administrator's power is created by the order of a court. Many of the historical distinctions between these two classes of officers, have in the development of the law become obliterated. Though the technical distinctions as to the name are preserved in the law, at present the duties of executors and administrators are substantially the same, except that if no will at all was made, the intestate's estate is divided according to some statute prescribed by the state, while in the case of a will, the distribution takes place in the manner directed by the will. A manifest advantage, however, is secured to the estate of a dying person by making a will and appointing executors, since in such a case, a possible conflict as to who shall carry out the wishes of the deceased may be avoided. Furthermore such executors, on making probate, are not usually required to give bonds, while administrators appointed by the court are always required to furnish security. A will, however, is not made void by reason of a failure to appoint therein an executor. Originally the operation of wills was confined exclusively to personal property, and the executor or administrator had nothing to do with the

deceased person's real estate. This was owing to the rules of the English common law by which real estate at once vested in the heir-at-law upon the death of the owner. At present in the United States, while personal property still remains the basis around which the executor's and administrator's functions are concentrated, they may be called upon to exercise a certain supervision over real estate where the executor is in fact directed to do so in the will, or where, by reason of a deficiency of personal assets the real estate of the deceased is applied in payment of the latter's debt.

In a general sense, it may be said that whoever is capable of making a will, is capable of acting as executor. The court however, in the interests of creditors and legatees, have power either to remove an obviously incompetent executor or on cause shown to exact security from him. The executorship being a personal matter cannot be assigned to anybody else, and upon the death of the executor, his duties will be performed either by the surviving executors, if more than one was originally appointed, or by an administrator to be selected by the court, with due regard to all the circumstances of the estate. The executor, though he derives his power primarily from the will, is not officially recognized until the will is admitted to probate and his authority confined by the issuance to him from the court of what are termed 'letters testamentary.' In the case of an administrator they are called 'letters of administration.' In case of administration, no probate is made. A person who without authority officiously intermeddles with the estate of the deceased, is styled an 'executor de son tont' (executor of his own wrong). Such a person, if not acting in good faith, is liable to persons injured by his acts to the extent of the property which he may have taken or the actual damage caused by him.

The duties of the executor and administrator are to make and file an inventory of the deceased's property, to pay his debts and funeral expenses, collect all his assets, and distribute the same among those entitled thereto. They must at all times keep accurate accounts of their doings. They may be compelled to make an accounting during the progress of their trust, also on finally closing the same. In American practice executors and administrators who have faithfully performed their duties are allowed compensation varying in different states, but generally taking the form of commissions on the amounts received and paid out. See for Scotch usage, DEAD'S PART: CONFIRMATION: VITIOUS INTROMITTER.

EXEC'UTORS, in Scotland: heirs *in mobilibus* (of movable possessions) of a person deceased intestate. They are the whole next of kin in the nearest degree in blood; but where the heir to the heritage is one of the

nearest of kin (e.g., the oldest son), he is not entitled to share in the movables without collation (q.v.). See SUCCESSION: MOVABLES.

EXEC'UTORY DEVISE', in Law: such a limitation of a future estate or interest in lands or chattels (though in the case of chattels, it is more properly a bequest) as the law admits in the case of a will, though contrary to the rules of limitation in conveyances at common law (Blackstone, *Comm.* ii. 334.) By common law, a freehold cannot be limited on a freehold, as an estate to A and his heirs; but if he die before he attain the age of 21, then to B and his heirs. Nor can an estate be given to commence at a time uncertain, as to A when he returns from Rome. But though these limitations would be void in a deed, common law will sustain them as executory devises. This form of limitation is restrained by the law against Perpetuities (q.v.), which requires that the estate must take effect within a life or lives in being and twenty-one years after. The law will not interpret a limitation as an executory devise, if it can be otherwise sustained. Within the period allowed for these estates, an executory devise constitutes a species of estate tail; and for this purpose, it is frequently used in America.

EXEDRA, n. *ĕgs'ē-dra* or *ĕgs-ē'drâ* [L. *exedra*—from Gr. *ex*, out, without; *hedra*, a seat: F. *exédre*]: in *antiq.*, the portico of the Grecian palæstra, in which disputations of the learned were held; so called from its containing a number of seats, generally open, like the pastas or vestibule of a Greek house; an assembly-room or hall for conversation; in *arch.*, a niche projecting beyond the general plan of a building; a porch or chapel projecting from a large building; a recess of a building.

EXEGESIS, n. *ĕks'ĕ-jē'sĭs* [Gr. *exēgēsis*, a leading out, an exposition—from *ex*, out of; *egĕŏmai*, I lead: F. *exégèse*]: critical exposition or interpretation of any writing, but usually, of a portion of Scripture; a paraphrastical explanation of any text or portion of Scripture. EX'EGETE, n. *-jēt*, one skilled or practiced in exegesis; an exegetist. EX'EGET'ICAL, a. *-jĕt'ĭ-kăl*, expository; tending to illustrate or explain; also EX'EGET'IC. EXEGETICS, n. *-jĕt'ĭks*, proper scientific interpretation, especially of Scripture. Hermeneutics and Exegetics are close allied but not identical. The former lays down the principle of Biblical interpretation; the latter deals with the practical application of the principles. In other words, Hermeneutics is a science, Exegetics is an art. EXEGE'TIST: same as EXEGETE. EX'EGET'ICALLY, ad. *-lĭ.*—*Exegesis* is applied usually in connection with biblical writings. The expositor or interpreter is called an *exegete*. To interpret a writing, means to ascertain thoroughly and fundamentally what are the conceptions and thoughts which the author de-

signs to express. For this purpose, it is necessary, in regard to books written in a foreign language, that the exegete should know well, first, the precise signification of the words and idioms employed by the writer: this is *grammatico-philological* exegesis. In the next place, he must be acquainted with the things denoted by these words, also with the history, antiquities, and modes of thought of the nation: this is termed *historico-antiquarian* exegesis. Both together constitute *grammatico-historical* exegesis. When only an exposition of the system of thought contained in a writing is sought after, this is termed *doctrinal* or *dogmatic* exegesis; while the investigation of a secret sense, other than that literally conveyed by the words of a writing, is termed *allegorical exegesis.* But if a writing is regarded from a practical point of view, and in reference to its bearing upon life and manners, the exposition is termed *moral* exegesis. The complete and coherent exegesis of a writing forms what is called a *commentary,* but, if restricted to certain difficult words or knotty points, the elucidations are termed *scholia.* The scientific exhibition of the rules and means of exegesis is called *Hermeneutics* (q.v.). In the earliest ages of the Christian Church, the allegorical method of exegesis prevailed. By the Alexandrian school in particular, it was greatly abused. Origen, however, the greatest of this school, has the credit of an endeavor to secure a basis for grammatical exegesis, by a sharp separation of the literal, the moral, and the mystical sense of Scripture. Besides the Alexandrian school, the Syrian historico-exegetic school had many adherents in the East. Among these may be mentioned Cyril of Jerusalem, Ephraem Syrus, John Chrysostom, and Theodorus of Mopsuestia. First, toward the end of the 4th, and during the 5th c., a narrowing of the principle of the free interpretation of Scripture begins to be observable, through the rapid development of monkery and the hierarchical system; in consequence of which, the importance of the classic writers was undervalued, and the study of them ultimately abandoned in the Western Church, while a feeling of superstitious reverence, wholly unintelligent and unscriptural, grew up for the letter of the 'Word,' and exegesis, if employed at all, was employed simply to bolster up preconceived views. By and by, independent exegesis was supplanted by the well-known *Catenæ,* consisting of expositions of books of Scripture strung together from the writings of the older church Fathers. In the East, the first of these was got up by Procopius, 520; in the West, by Primasius, 550. Although much was done for the exegesis of the Old Testament by eminent Jewish scholars, such as Solomon Jarchi, Aben-Esra, and David Kimchi, Christian theologians for the most part, knowing only the text of the Vulgate, stuck, during the dark ages, to the interpretations of the Fathers. First, in the

12th, 13th, and 14th c., efforts were made by individual scholastics, especially by Abelard, St. Bernard of Clairvaux, Thomas Aquinas, and Nicholas of Lyra, to re-introduce something like a grammatico-historical exegesis of Scripture. But it was mainly to the great revival of letters in the 15th c., and the humanistic scholars whom it produced, such as Laurentius Valla, Erasmus, etc., that an advance in exegesis was owing. The Complutensian Polyglot also exercised a great and beneficial influence. Shortly afterward, the Reformation gave an impulse to exegesis, so powerful, that it is felt at the present day; and, indeed, its effect is far more visible in the recent biblical criticism of Germany than it was in the days of Luther himself. The desire for the unfettered exegesis of Scripture strongly animated the reformers, but, in fact, the long black night of ignorance—known as the dark or middle ages—influenced them too, and disqualified them for framing at once a comprehensive exegetical science. It required two centuries to recover from the effects of mediæval ignorance. The more important Lutheran exegetes are: Luther, Melanchthon, Brenz, Joach, Camerarius, Strigel, Chemnitz, etc.; of the Reformed or Calvinistic school may be mentioned Calvin, Zwingli, Œcolampadius, Bucer, Beza, Bullinger, Grotius, Clericus, etc.; and of the Rom. Catholics, especially Paul Sarpi. During the 17th c., the exegesis of Scripture was for the most part at a standstill, but about the middle of the 18th c. it suddenly revived. This revival is due principally to Joh. Aug. Ernesti (q.v.), and J. Sal. Semler (q.v.), who established new principles of criticism and hermeneutics, through which grammatico-historical exegesis once more made its appearance. The labors of Wetstein and Kennicott in regard to biblical MSS. were of immense service. Since their day, till the present, criticism has been constantly at work on the writings of the Old and New Testament. Cognate languages have been more and more profoundly studied; the antiquities of the East, of Egypt, Assyria, Arabia, and other countries, have been investigated, and brought to bear on the subject; the manners and customs in these lands, and which, in some of them, have prevailed from time immemorial: the laws that determine the growth of civilization in nations, and enable us to enter into and comprehend the condition of mind peculiar to races in a primitive stage of development, and to appreciate their modes of thought, and to weigh the value of their literary and religious records—all these have received, and are receiving careful attention from numerous scholars, so that it is not too much to say that we are at the present day better fitted—so far as outward helps go—to understand the real meaning of Scripture, than those who have lived at any other period subsequent to its composition. Among the eminent names in the recent development of biblical exegesis are F. A.

Wolf, J. Dav. Michaelis, Eichhorn, Gesenius, Wahl, Bretschneider, Winer, Rosenmüller, Hitzig, Hirzel, Ewald, Umbreit, De Wette, Knobel, Lücke, Paulus, Meyer, Olshausen, Hengstenberg, etc. The influence of the *grammatico-eritical*, and *eritieo-historical* exegesis of modern Germany, is beginning to make itself felt in Britain and the United States. Among important contributions to the science recently made by British scholars, are those by Conybeare and Howson, Alford, Stanley, Jowett, Ellicott, etc. In the United States a vigorous and profound class of exegetes is now in training, and will soon show valuable results.

EXELMANS, *ĕks ĕl-mŏng′*, Remy Joseph Isidore, Comte: 1775, Nov. 13—1852, July 22; b. Bar-le-duc: French general. He entered the army 1791, was promoted to capt. 1799, served with distinction in the campaign of Naples under Macdonald and Championnet, and 1801 was attached as aide-de-camp to the staff of Murat. In 1808, while with Murat in Spain, he was arrested and sent to England, where he remained a prisoner three years. He was with Napoleon in the Russian campaign 1812, for his brilliant conduct in which, the emperor created him gen. of division. Exelmans appears to have been esteemed equally under every successive government. On the fall of Napoleon, he was for some time banished from France, but he was permitted to return 1819. In 1831 Louis Philippe restored his titles and rank and Louis Napoleon named him grand chancellor of the Legion of Honor, and 1851, March 11, raised him to the dignity of *Maréehal de Francc*. His death was the result of a fall from his horse.

EXEMBRYONATE, a. *ĕks-ĕm′brĭ-o-nāt*, a.: in *bot.*, not having an embryo. Used of Cryptogamic, or as Richard calls them, Inembryonate plants; so designated from their not possessing a proper embryo like Phanerogams.

EXEMPLAR, n. *ĕgz-ĕm′plĕr* [F. *exemplaire*, a pattern, a sample—from mid. L. *exemplārĭŭm;* L. *exemplar*, a pattern—from L. *exemplum*, a sample]: anything to be copied or imitated; a model. Exemplary, a. *ĕgz′ĕm-plēr-ĭ*, serving for a pattern or model for imitation; such as may serve as a warning to others: N. copy of a book or writing. Ex′emplar′ily, ad *ĭ-lĭ*. Ex′emplar′iness, n. the state of being a pattern for imitation.

EXEMPLIFY, v. *ĕgz-ĕm′plĭfī* [L. *exemplum*, a sample, a copy, a transcript; *făcĭō*, I make]: to show or illustrate by example. Exem′plifying, imp. Exem′plified, uu. *-fīd*. Exem′plifier, n. one who. Exem′plifica′tion, p. *fĭkā′shŭn*, the act of illustrating; an illustration by example; an attested copy.

EXEMPLI GRATIA, *ĕgz-ĕm′plī grā′shĭ-ă* [L. *grātĭă*,

for the sake; *exemplī*, of example]; for instance; contracted into Ex. GR., or more usually into E. G.

EXEMPT, a. *ĕgz-ĕmt′* [F. *exempter*, to exempt, to free—from L. *exemptus*, taken out, freed—from *ex*, out of; *emptus*, bought]: not liable to; free from any service, tax, evil, etc.; not included: V. to free from any charge, burden, evil, etc.; to privilege. EXEMP′TING, imp. EXEMP′TED, pp. EXEMP′TION, n. *-ĕm′shŭn* [F.—L.]: freedom from any service, charge, evil, etc., to which others are subject; privilege.

EXEQUATUR, n. *ĕks′ĕ-kwā′tĕr* [L. *exĕquātŭr* for *exsĕquātur*, let him perform]: a written authority whereby a consul or commercial agent may be recognized.

EXEQUIES, n. plu. *ĕks′ĕ-kwĭz* [L. *exsĕquiās*, the following a corpse, a funeral procession or rites—from *ex*, out of; *sĕquor*, I follow: It. *esequie*]: the ceremonies or rites at a funeral—*obsequies* commoner. EXE′QUIAL, a. *ē′kwĭ-ăl*, pertaining to funeral rites.

EXERCISE, n. *ĕks′ĕr-siz F. exercice*, an exercise—from L. *exercĭtĭŭm*, exercise—from L. *exercĕō*, I drive on or keep busy—from *ex*, out of; *arcĕō*, I shut up]: any labor or exertion of the body to promote health or for amusement; any exertion as in a profession, business, or employment; practice; application of the mind; a lesson or example for practice: V. to exert; to cause to act in any manner; to train by use; to discipline; to use exertion for amusement, health, or proficiency; to keep employed. EX′ERCISING, imp. EX′ERCISED, pp. *-sīzd*. EX′ERCISABLE, a. *-a-bl*, that may or can be exercised, used, employed, or exerted. EXERCITATION, n. *ĕks-ĕr′sĭ-tā-shŭn* [L. *exercĭtātĭōnem*]: practice—same as *exercise*.—*Exercise* is an indispensable element of health; to allow complete inaction of any part or function, is to initiate disease, probably even structural change, or atrophy. Hence the development of the muscular system, of the secretions, and even of the mind and its organ, the brain, require the more or less regular use of exercise, either in the form of productive and useful work, or by means of artificially devised methods. See GYMNASTICS.

EXER′CITOR, n. [L.]: in *law*, the person to whom the profits of a ship belong, whether he be owner or hirer.

EXERGUE, n. *ĕks-ĕrg′* [F. *exergue*—from Gr. *ex*, out of; *ergon*, work]: the small space on the face of a medal or coin left for a date, name, etc.—usually beneath the base-line of the subject engraved.

EXERT, v. *ĕgz-ĕrt′* [L. *exsĕrtus*, thrust out, put forth—from *ex*, out of; *sĕrō*, I join or bind together]: to put into action, as strength, or the mind; to use with effort; to bring into active operation; to strive. EXER′TING, imp. EXER′TED, pp. EXER′TION, n. *-ĕrshŭn*,

effort; the act of striving or straining.—SYN. of 'exertion': attempt; endeavor; trial; experiment; essay; struggle.

EXETER, *ĕks'ē-tẽr:* town of Rockingham co., N. H.: on the E. river and the Boston and Maine railroad; 12 m. s.w. of Portsmouth, 17 m. s.s.w. of Dover, 51 m. n. by e. of Boston. Exeter is built around the falls on both banks of the river at the head of tide water; contains a court house in which sessions of the state and the United States circuit and dist. courts are held, several churches, public library, good schools, a national bank, and savings banks, woolen mill, pottery, machine shop, cotton mill, grist mills, and several carriage factories. It is noted chiefly as the seat of an academy founded by John Phillips, LL.D., who bequeathed to it a large portion of his estate 1781 (see PHILLIPS EXETER ACAD.), and of the Robinson Female Seminary, organized 1869 with an endowment of $300,000. This ancient town is noted for culture and intelligence. Exeter was settled 1638, suffered by Indian wars 1690–1710, and was the cap. of the state during the revolutionary war.—Pop. (1910) 4,897.

EXETER, *ĕks'ē-tẽr* (the *Cær-Isc* of the Britons, the *Isca Damnoniorum* of the Romans, *Exancester* of the Saxons): city, episcopal see, separate county, parliamentary and municipal borough, and river-port, in the s.e. of Devonshire, and the cap. of that county. It is on an acclivity on the left bank of the Exe, 10 m. n.w. of its mouth, 170 m. w.s.w. of London, 73 m. s.w. of Bristol. It is on the whole well built and clean, and has two main lines of street meeting near the centre. There are some fine squares and terraces. The Guildhall has a singular portico, added 1593, and projecting into the street. It was restored, with considerable regard to artistic effect, 1864. In 1865 a post-office was erected; also a lunatic asylum, just outside the city. A quadrangle of almshouses, 45 in number, was completed 1866, with a church attached; and the Albert Memorial Museum was opened 1868. Exeter cathedral, magnificent in its ornamentation, was erected 1112–1478. It has Norman transeptual towers; but most of it is in the decorated style. The church was carefully restored 1870–77, by Sir Gilbert Scott. In one of its towers is the great Tom of Exeter or Peter's Bell, 12,500 lbs. weight, and a large curious antique clock. Exeter has a large floating ship-basin, 917 ft. long, 90 to 110 ft. broad, and 18 ft. deep; and a ship-canal, 15 ft. deep and 30 ft. broad. This canal extends 5 m., and terminates at Turf, about 2 m. from the head of the estuary of the Exe. Exeter has magnificent nurseries, and exports dairy, farm, and orchard produce from a neighborhood rich in such products. The town sends one member to parliament. Exeter was anciently the chief residence of the W. Saxon kings. Exeter

bishopric, fixed here 1050 by Edward the Confessor, includes Devon and Cornwall, 23 deaneries and 588 benefices. The city was formerly surrounded with walls and strongly fortified. On a height n. of Exeter are the ruins of Rougemont Castle, built by William I., on the site of one said to be as old as Cæsar's time. Many Roman and Greek coins have been found in Exeter, besides tesselated pavements, fragments of columns, and small bronze statues. Pop. of parliamentary borough (1901) 46,940.

EX'ETER COL'LEGE, Oxford: founded 1314, by Walter de Stapledon, Bishop of Exeter, who removed from Hart Hall to the present site of Exeter College, a rector and twelve fellows. In 1404, Edmund Stafford, Bishop of Salisbury, added two fellowships, and gave the college its present name. Sir William Petre, 1565, founded eight more; and 1636, Charles I. annexed one more for the islands of Jersey and Guernsey. In 1770, Mrs. Shcers left certain rents for the establishment of two fellowships. All these fellowships were originally appropriated to various archdeaconries or counties, especially in the west of England. A peculiarity in this college was, that the above foundations, though generally called fellowships, were, strictly speaking, only scholarships. Important changes were introduced under the authority of 17 and 18 Vict. c. 81. The number of fellowships was reduced to 15—all open without any restriction as to place of birth. The revenues of two fellowships were divided among the rectorship and the 15 fellowships. The remaining eight fellowships were devoted to the foundation of 22 scholarships; ten open without restriction; ten limited to persons born, or for three years educated in the diocese of Exeter; and two limited to persons born in any of the Channel Islands. Several exhibitions also are attached to the college; and there are about 16 benefices in the gift of the Society. The number of names on the books is about 750.

EX'ETER (or EXON) DOMES'DAY: see DOMESDAY. EXETER-ELM, n. in *bot. Ulmas Montana.* EXETER-OAK, n. in *bot. Quercus cerris.*

EX FACIE, phrase, *ĕks fā'shĭ-ē* [L.]: from the face of; applied to what appears on the face of a document or writing.

EXFOLIATE, v. *ĕks-fō-'lĭ-āt* [mid. L. *exfŏlĭātus*, stripped of leaves—from L. *ex*, out of; *fŏlĭŭm*, a leaf: F. *exfolier*]: to come off in scales; to scale off. EXFO'LIATING, imp. EXFO'LIATED, pp. EXFO'LIA'TION, n. *-āshŭn* [F.—L.]: the process of separation in scales or splinters. EXFO'LIATIVE, a. *-ātĭv*, having the power of causing exfoliation.

EXHALE, v. *ĕgz-hāl'* [F. *exhaler*—from *L. exhālārĕ*, to breathe out—from *ex*, out of; *hālō*, I breathe: It. *esalare*]: to send out, as vapor or fume; to breathe

out; to evaporate. EXHA'LING, imp. EXHALED', pp. *-hāld'*. EXHALATION, n. *ĕks'hă-lā'shŭn* [F.—L.]: the act of breathing out; the act or process of sending forth in fume or vapor—generally applied to what rises in the form of vapor from the earth; that which is emitted; effluvia. EXHALABLE, a. *ĕgz-hā'lă-bl*, capable of being evaporated. EXHALANT, a. *ĕgz-hā'lănt*, having the quality of evaporating or breathing out.

EXHAUST, v. *ĕgz-awst'* [L. *exhaustus*, emptied by drawing—from *ex*, out of; *haustus*, drained, emptied]: to empty by drawing out; to use and expend the whole; to fatigue very much. EXHAUSTING', imp.: ADJ. wholly or partially depriving of a quality or power, as strength. EXHAUST'ED, pp. EXHAUST'ER, n. one who. EXHAUS'TIBLE, a. *-tĭ-bl*, that may be exhausted. EXHAUST'ION, n. *-hawst'yŭn* [F.—L.]: the act of drawing out or emptying; state of being emptied; state of being deprived of strength or spirits, in which the vital powers act feebly. EXHAUS'TIVE, a. *-haws'tĭv*, tending to deprive of power, strength, or quality: that has treated the subject fully and from every point of view. METHOD OF EXHAUSTIONS, mode of proving mathematical propositions regarding quantities by continually diminishing the difference between them, as in the case of the areas of polygons inscribed and circumscribed to a circle when the number of sides is indefinitely increased. The method was frequently employed by the ancient geometers; its fundamental maxim, as stated by Euclid, being that those quantities are equal whose difference is less than any assignable quantity. Euclid employs the method in Book x. Prop. 1; and it was used by Archimedes to prove that the area of a circle is equal to that of a right-angled triangle whose one leg adjoining the right angle is the radius, and the other the circumference. In this ancient method is seen the rudimentary form of the modern integral calculus.—SYN. of 'exhaust': to drain; consume; spend; weary; tire out; empty; expend; wear out; excite.

EXHAUSTION OF SOILS: see MANURE: SOILS.

EX'HEDRA: same as EXEDRA.

EXHIBIT, v. *ĕgz-hĭb'ĭt* [L. *exhĭbĭtŭs*, shown or displayed—from *ex*, out of; *hăbĕō*, I have or hold: F. *exhiber*]: to present to view; to offer for inspection; to display; to show; to administer as a medicine: N. any paper formally exhibited in a court of law. EXHIB'ITING, imp. EXHIB'ITED, pp. EXHIB'ITANT, n. *ant*, in *law*, one who makes an exhibit. EXHIB'ITOR, n. *ĭ-tẽr*, one who exhibits; also EXHIB'ITER, n. *-tẽr*. EXHIBITION, n. *ĕks'hĭ-bĭsh'ŭn* [F.—L.]: a showing or presenting for inspection; any public show; display; that part of the income of a school or college applied for the maintenance of students at English universities—in *Scot.*, called a *bursary;* an annual prize of money. EX'HIBI'TIONER, n. a student who enjoys an exhibition.

EXHIBITIVE, a. *ĕgz-hĭb'ĭ-tĭv*, representative. EXHIB'ITIVELY, ad. *-lĭ*. EXHIB'ITORY, a. *ĭ-tẽr-ĭ*, showing; displaying. EXHIB'IT, n. any article displayed to view, as in a cattle-show or industrial exhibition: a law term, as in 'havers and exhibits,' signifying documents exhibited by a witness before a legal tribunal: see HAVERS. ART EXHIBITION: see ART EXHIBITION.

EXHIBI'TION, INDUSTRIAL [Fr. *Exposition de l'Industrie*]: displays, usually international, of the products of labor. The first was in France, 1798, at the suggestion of the Marquis d'Avèze. It was held in the Maison d'Orsay and its grounds; but it appears to have been rather a collection of such objects of French art-manufacture as could be borrowed from their owners, than an assembling together of competing artists and manufacturers with their respective works. In the same year, another exhibition was held in Paris, on a grander scale, and with considerable success. It embraced all kinds of manufactures; hence has been claimed, but not justly, as the first of industrial exhibitions. Another was held 1802, under the consulate of Napoleon; and these successes led to the establishment of triennial exhibitions.

In Britain, 1850, the Prince Consort originated the plan of holding a universal exhibition open to all comers. Previously, however, the Royal Dublin Soc., since 1829, had had triennial exhibitions of native industry.

In England, the first well-organized exhibitions were those of the Cornish Polytechnic Soc., illustrating the mineral wealth of the county, and its mechanical appliances for mining. These were annual until 1850. Manchester, Birmingham, and Liverpool also held local exhibitions; that of Birmingham, 1849, far the most important, was the prototype of the 1851 exhibition.

For the great Exposition in London, 1851, proposed by Prince Albert, the subscription list to a guarantee-fund was opened by the queen with £1,000. The exhibition took place in a vast structure of iron and glass, called the Crystal Palace, in Hyde Park, London. The edifice, planned by Sir Joseph Paxton (q.v.), was opened by her majesty, 1851, May 1. It was 1851 ft. long by 456 ft. broad, and 66 ft. high; area 13 acres. On the ground floor and galleries were 8 m. of tables. The glass in the structure weighed more than 400 tons. The number of exhibitors exceeded 17,000. The exhibition was open 144 days, closed Oct. 11. The entire number of visitors was 6,170,000, averaging 43,536 per day. The largest number at one time in the building was 109,760, Oct. 8. The entire money drawn for tickets of admission amounted to £505,107; and after all expenses were defrayed, a balance of £150,000 was left over; so that there was no call on those who subscribed the guarantee fund. Popularly, this great exhibition was called the World's Fair, for it drew visitors from

all parts of the world. When the exhibition was over, the building was cleared away. In 1852, an exhibition (domestic) was held in Cork, Ireland; in 1853, one in Dublin (international) including a fine gallery of pictures; in the same year, one in New York (international) in a building of glass and iron called the Crystal Palace, on Reservoir Square, Sixth Ave. and 42d St. France, 1855, repeated the experiment with immense success; both the industrial and the art collections were such as the world had never seen before. Though wanting the imposing magnitude of the Hyde Park building, the contents of the Palais de l'Industrie, with its detached Picture-gallery and its Annèxe, were of the choicest description, and reflected the highest credit on French taste and skill. Several other continental nations followed with various success, and now every country looks upon an exhibition of its industrial resources and productions, from time to time, as a grand necessity. In 1861, there was an exhibition at Haarlem, in which a vast assemblage of admirably arranged specimens illustrated every industry followed by the most industrious and methodical people of Europe.

Among the more important international exhibitions held since the Centennial Exhibition (q. v.) in Philadelphia 1876, are those at Paris 1878; Berlin and Sydney 1879; Melbourne 1880; Berlin, Moscow, and Buenos Ayres 1882; Louisville, Caracas, Amsterdam, and Chicago (railroad appliances) 1883; Calcutta and New Orleans (cotton) 1884; Antwerp 1885; Edinburgh and Liverpool (shipping) 1886; Manchester 1887; Melbourne (centennial), Glasgow, and Brussels 1888; Boston (maritime) and Paris 1889; and in London (electrical) 1882, (fisheries) 1883, (health) 1884, (inventions) 1885, (colonial) 1886, (American) 1887, (Italian, Irish, and Anglo-Danish) 1888, and (Spanish) 1889. As completing a series of commemorations of the 400th anniversary of the discovery of America by Columbus, the Columbian World's Exhibition (q.v.) under the auspices of the U. S. govt. was held at the city of Chicago on a scale of unprecedented grandeur.

The universal exhibition at Paris 1889, commemorating the centennial of the fall of the Bastile, excelled all its predecessors in magnitude and comprehensiveness. It was organized and conducted conjointly by the govt., the city of Paris, and an association of guarantors, the govt. agreeing to advance $3,400,000, the city $1,600,000, and the association $3,600,000, total $8,600,000. Of this total, $6,330,000 were apportioned for the erection of the various buildings, and for improving the parks, gardens, etc., $670,000 for the expenses of administration; and $1,000,000 for working expenses, $600,000 being set aside for use in case of emergency. With the included grounds, the exhibi-

tion occupied 173 acres. The Eiffel Tower (q.v.) was one of the principal attractions, and as a marvel of constructive skill was rivaled by the Machinery Palace, which had a span of 377 ft., and was without pillars or other similar support. The exhibition was opened May 5 and closed Nov. 6, and during this period 28,000,000 persons passed its turnstiles, 111,000 on the opening day, 500,000 on the closing. The following estimates were made of visitors from various countries: Great Britain 600,000; United States and Canada 125,000; Belgium 118,649; Germany, 27,516; Holland, 11,365; Russia, 2,006; and so on down to Oceanica, credited with 500. The total receipts were $9,800,000 and expenditures $8,200,000. The octroi of Paris received January—October 28 an increase of $1,800,000 in duties collected over the like period 1888, and the city of Paris received $540,000 from the profits of the exhibition; 60,000 persons exhibited wares of some kind; 32,468 of them were rewarded by the juries as follows: grand prize 903, gold medal 5,153, silver medal 9,690, bronze medal 9,325, and honorable mention 8,070. The share of the United States in the exhibition was unsatisfactory alike to its citizens and those of other countries. Congress appropriated only $250,000 to its commissioners and the U. S. exhibits occupied the fourth rank in size. But in one respect the United States surpassed all other nations: its electrical display was exceeded in popular interest only by the Eiffel Tower. The site of the exhibition was, as in 1867, the Champ de Mars, to which was added the Esplanade des Invalides. The Pont d'Iena connected the Champ de Mars with the grounds of the Trôcadéro Palace, and was doubled in width for the occasion. Looking from this bridge toward the Ecole Militaire, the eye was attracted first by the row of 39 buildings designed and erected by Charles Garnier, the architect and archæologist, to reproduce the typical homes of the human race in all the past ages. Immediately beyond this group was the Eiffel Tower, surrounded by small ornamental lakes and specimens of the architecture of various S. American republics. The exhibition was a large financial success.

In 1894, the Californian Mid-Winter Exhibition was held at San Francisco. The Cotton States and Industrial Exposition, Atlanta, Ga., was a notable Southern event during the year following, remaining open and being well patronized from September to December. The Tennessee Centennial Exposition, at Nashville, was held in 1897, the exhibit being on view during six months. The Trans-Mississippi Exposition, Omaha, occurred in 1898. Three years later came the Pan-American Exposition, Buffalo. In 1904 the World's Fair was held at St. Louis, in 1905 the Lewis and Clark Exposition at Portland, Ore., and in 1907

the Jamestown Exposition at Jamestown, Va. See EXPOSITIONS.

EXHILARATE, v. *ĕgz-hĭl'er-āt* [L. *exhĭlărātus*, gladdened greatly—from *ex*, out of; *hilărātus*, cheered]: to cheer; to gladden; to make cheerful; to enliven; to become joyous.

EXHORT, v. *ĕgz-hŏrt'* [F. *exhorter*—from L. *exhortor*, I encourage—from *ex*, out of; *hortor*, I advise, I instigate]: to advise; to warn or caution; to animate or incite by words. EXHORT'ING, imp. EXHORT'ED, pp. EXHORTATION, n. *ĕkz'hŏr-tā'shŭn* [F.—L.] the act of exhorting; inciting to laudable deeds; formal advice; counsel.

EXHUME, v. *ĕks-hūm'* [F. *exhumer*, to unbury—from mid. L. *exhŭmārĕ*—from L. *ex* out of; *humus*, the ground]: to dig up what has been buried; to disinter.

EXIGENT, a. *ĕks'ĭ-jĕnt* [L. *exigens* or *exigen'tem*, driving or thrusting out—from *ex*, out of; *agens*, doing or driving]: pressing; requiring immediate aid or action. EX'IGENCE, n. *-jĕns*, or EX'IGENCY, n. *-jĕn-sĭ*, urgent need or want; pressing necessity. EX'IGIBLE, a. *-jĭ-bl*, capable of being demanded.—SYN. of 'exigency': emergency; crisis; conjecture; demand; urgency; pressure; distress; necessity.

EXIGUITY, n. *ĕks'ĭ-gū'ĭ-tĭ* [F. *exiguité*, scantiness—from *exigu*, scanty—from L. *exĭgŭŭs*, scanty, small]: smallness; slenderness. EXIG'UOUS, a. *-ū-ŭs*, small; scanty.

EXILARCH: title given to the head of the Babylonian Jews, known as 'resk galuta,' or (prince of the exile), which was invested with special prerogatives and was hereditary in a line descended, it was claimed, from David. Its origin is little known, and the first historical mention is in connection with the effort to make the Jews of Babylonia independent of Palestinian authorities. Huna was the first incumbent, followed by a number of others in centuries under Persian and Arabian domination, until the office became extinct with Hezekiah in 1040, although the title is occasionally found later. The failure of Anan to secure the dignity led to the Karaite schism (q.v.) with exilarchs of their own. The Babylonian Exilarchs did much to promote Jewish solidarity in the Diaspora. The office had its retinue, forms, income and privilegs.

EXILE, n. *ĕgz'īl* or *ĕks'īl* [F. *exil*, banishment; *exile*, the person banished—from L. *exsĭlĭŭm*, banishment—from *exsul*, an exile]: the state of being expelled from one's native country; banishment, sometimes voluntary; the person expelled from his native country; one who leaves his own to reside in another country; one separated from friends or country by necessity; V. to drive away or banish from one's native country by misfortune

or necessity. EXI'LING, imp. EXILED, pp. *ĕgs'ild* or *ĕg-zīld'*. EXILIC, a. *ĕgs'ĭl-ĭk*, relating to or connected with exile or banishment: *specifically*, relating to the captivity of the Hebrews in Babylon.—SYN. of 'exile, v.': to banish; expel; transport; proscribe; drive away.

EXILITY, n. *ĕks-ĭl'ĭ-tĭ* [L. *exīlĭs*, thin, slender]: slenderness; smallness.

EXINANITION, n. *ĕks'ĭn-ă-nĭsh'ŭn* [L. *ex*, out of, *inānis*, empty, void]: in *OE.*, emptiness; loss; privation.

EXINDUSIATE, a. *ĕks-ĭn-dū'zĭ-āt:* in *bot.*, not having an indusium; used chiefly of ferns.

EXINTINE, n. *ĕgz-ĭn'tĭn* [L. *ex*, from; *intus*, within]: in *bot.*, one of the inner coverings of the pollen-grain: see EXTINE.

EXIST, v. *ĕgz-ĭst'* [F. *exister*, to exist—from L. *existĕrĕ:* L. *existens*, being visible, existing: It. *existere*]: to be; to have an essence or real being; to live; to endure. EXIS'TING, imp.: ADJ. having being or life; actual. EXIS'TED, pp. EXIS'TENCE, n. *-ĭs'tĕns* [F.—L.]: real being or essence; life; animation. EXIS'TENT, a. having being.—SYN. of 'exist': to subsist; occur; continue.

EXIT, n. *ĕks'ĭt* [L. *exit*, he goes out—from *exīrĕ*, to go out—from *ex*, *īrĕ*, to go]: the departure of a player from the stage; a word placed on the margin of a play to indicate this; the act of quitting the stage of life; death; a departure; a passage out of any place; a way. EXITUS, n. *-tŭs*, in *law*, issue, offspring; yearly rents or profits of land. EX'EUNT, plu. *-ē-ŭnt* [L.]; they go out. EX'EUNT OMNES, *ŏm'nēz* [L. *exĕŭnt*, they go out; *omnēs*, all]: they all go out.

EXITELE or EXITELITE, n. *ĕks'ĭ-tĕl-īt* [F. *exitèle*—from Gr. *exitēlos*, going out, disappearing, fading]: in *mineral.*, the same as Valentinite (q.v.).

EX LEGE, phrase, *ĕks lē'jē* [L. out of the law]: arising from law.

EX MERO MOTU, phrase, *ĕks mēr'ō mō'tū* [L.]: of one's own motion.

EXMOOR FOREST, *ĕks'môr:* moory, mostly uncultivated waste, consisting of dark ranges of hills and lonely valleys, 14 sq. m. in area, in the w. of Somersetshire and n.e. of Devonshire. It is bordered by deep wooded glens. The hills rise in Dunkery Beacon to 1,668 ft., in Chapman Barrow to 1,540, and in Span Head to 1,510. Devonian slates, with some new red sandstone in the n. form the substratum. It is covered with heath, interspersed with juniper, cranberry, and whortleberry, with much meadow-land. Throughout this tract there is a native breed of ponies, known as Exmoor ponies, reputed stout and hardy. Since 1851, Exmoor has become an iron-mining district. The river Exe, and its tributary the Barle, rise in Exmoor. The region is subject to winds and mists.

EXMOUTH, *ĕks'mŭth:* town in the e. of Devonshire, on the left bank of the mouth of the Exe, 10 m. s.e. of Exeter; at the base and on the slope and top of a hill rising from the sandy estuary of the Exe. It is noted for its mild climate. From about 1700, it was the chief watering-place on the Devon Coast, till the rise of Torquay. There is a fine promenade on a sea-wall 18 ft. high. The Woodbury Hills on the e. 800 ft. high, protect it from the e. winds. Here Sueno the Dane landed 1003. It was taken by the royalists 1646. Pop. (1901) 10,485.

EXMOUTH, *ĕks'mŭth,* Edward Pellew, Viscount: 1757, Apr. 19—1833, Jan. 23; b. Dover, England: naval commander. He entered the British navy when 13 years of age, and first attracted notice by his gallant conduct in the battle on Lake Champlain, 1776, Oct. 11. In 1782, he attained the rank of post-captain. In 1793, in command of the *Nymphe,* frigate of 36 guns, he captured *La Cleopatre,* French frigate, which carried the same number of guns. For this victory he was knighted. In 1799, he received the command of the *Impétueux,* 78 guns, and was sent to the French coast, where many of his most brilliant actions took place. In 1804, Sir E. Pellew as advanced to the rank of rear-admiral of the red; in 1808, to that of vice-admiral of the blue; and in 1814, he was raised to the peerage, with the title of Baron Exmouth of Canonteign, Devonshire, with a pension of £2,000 a year. In 1816, he was sent to Algiers, to enforce the terms of a treaty regarding the abolition of Christian slavery, which the dey of Algiers had violated. With a combined fleet of 25 English and Dutch vessels, he bombarded the city for seven hours, and inflicted such immense damage, destroying all the Algerine fleet and many of the public buildings, that the dey consented to every demand. Exmouth who had been wounded in the leg and cheek in this action, received on his return to England the thanks of both houses of parliament, and was promoted to the rank of viscount, 1816, Dec. 10. In 1821, he retired from public service, loaded with honors.

EX NECESSITATE, phrase, *ĕks nē-sĕs-ĭ-tā'tē* [L.]: of or from necessity; from the necessity of the case.

EXNER, Franz (1802–53). Born and brought up at Vienna, where in 1827 he began to teach philosophy. In 1831 he became professor of philosophy at the university of Prague. He was appointed to a ministerial position in 1848 and died at Padua where he was residing as ministerial commissary.

EXO, *ĕks'ō* or *ĕgz'ō* [Gr.]: a Greek prefix, signifying 'on the outside.'

EXOCCIPITAL, n. *ĕks-ŏk-sĭp'ĭ-tal* [L. *ex,* out; Eng. *occipital*]: in *anat.,* condyloid portions of the occipital bone; in *comp. anat.,* the lateral parts of the first

cranial segment, corresponding to the order of the *foramen magnum* in man.

EXOCŒTUS, n. *ĕks-ō-sē'tŭs* [L. *exocœtus;* Gr. *exōkoitos;* as adj., sleeping out; as n. a fish that comes upon the beach to sleep; *exō,* without; *koitos,* a bed, sleep]: in *ich.,* genus of *Scombresocidæ;* the body is moderately compressed, with large pectoral fins, the rays of which are stout and firm; the arm-bone or radius of this fin is also large. *Exocœtus exiliens* is the Greater Flying-fish.

EXOCULATION, n. *ĕks-ŏk-ū-lā'shŭn* [L. *ex,* out of; *oculus,* an eye]: the act of taking out an eye.

EXOCE'TUS: see FLYING-FISH.

EXODIC, a. *ĕks-ŏd'ĭk:* in *phys.,* conducting influence from the spinal marrow. Used specially of the motor nerves.

EXODIUM, n. *ĕks-ō'dĭ-ŭm* [L.—from Gr. *exodion*]: afterpiece in a theatre, usually played after tragedies; a farce.

EXODUS, n. *ĕks'ō-dŭs* [Gr. *ex,* out of; *hodos,* a way]: the second book of the Old Testament; departure of the Israelites from Egypt; a departure from a place.—Exodus, the second book of the Pentateuch, may be regarded as composed of two parts—the first historical, and the second legislative. The historical part extends to the end of ch. xviii. It embraces a narrative of the various preparations, natural and supernatural, under the providence of God for the deliverance of the Israelites from their bondage in Egypt, and describes the accomplishment of their deliverance, and the journeyings of the people in the wilderness as far as Mount Sinai. The legislative part is devoted to a minute and elaborate account of the institution of the theocracy. The book presents three aspects of Hebrew history. We have, first, a picture of a people enslaved; second, of a people redeemed from bondage; and third, of a people sanctified and set apart to the service of God. The period embraced by the history of the book is usually reckoned at 142 or 145 years, which number is obtained as follows: From the death of Joseph to the birth of Moses, 60 or 63 years; from the birth of Moses to the departure from Egypt, 80 years; and from the departure out of Egypt to the erection of the tabernacle, 1 year. It cannot be denied, however, without wildly violating all the ordinary laws of the increase of population, that this is much too short a period to account for the existence of such a number of Hebrews as left Egypt—viz., 600,000, exclusive of women and children—i.e., in all, at least 2,500,000. Those who went down into Egypt with Jacob were 'threescore and ten souls,' and in 215 years, these, though prohibited from intermarrying with the Egyptians, had amounted to between two and three millions. The writer of Ex-

odus, indeed says (ch. xii., verse 40) that 'the sojourning of the children of Israel, who dwelt in Egypt, was 430 years,' adding that they left the land 'even the selfsame day' on which they had entered it. This statement, however, does not seem to harmonize with the author's previous narrative, and is certainly inconsistent with the language of the apostle Paul, who says (Gal. iii. 17) that the law was given 430 years after the covenant with Abraham, which took place about 215 years before Jacob and his sons went down into Egypt, so that, according to this view, the Israelites could only have been in Egypt 215 years. This is the number commonly accepted; but it is not wonderful that some writers should affirm that 'it would be more satisfactory if we could allow 430 years for the increase of the nation in Egypt rather than any shorter period.' A still longer period would undoubtedly afford additional satisfaction; and Bunsen, in his *Ægypten's Stelle in der Weltgeschichte*, endeavors to show that the Israelites were in Egypt for *fourteen* centuries instead of two, and that the number 215 only indicates the period of oppression, the time when they were 'evilly entreated.' This conclusion is, of course, arrived at by the application of principles of criticism not generally recognized in the schools of British theology: but there seems no avoiding the conclusion, that the usual chronology is wrong.

May it not be that the interval which elapsed between the death of 'Joseph and all his brethren, and all that generation' (Ex. i. 6), and the period when there arose up a new king over Egypt which knew not Joseph (Ex. i. 8), was much longer than we suppose? The passage itself in Exodus seems to favor this idea; for the intervening verse (Ex. i. 7) speaks of the children of Israel 'increasing and multiplying, and waxing exceeding mighty, and filling the land,' without any reference at all to the time occupied in this process; and such words are certainly more applicable to a series of centuries than of years, while centuries, besides, would harmonize better than years with the statement that the Egyptian king knew not (i.e., had forgotten all about) Joseph. The only grave objection to this otherwise extremely probable hypothesis, is its incompatibility with the statement of St. Paul; and perhaps, as in a like case, Luther said of the inspired Stephen, 'he was no historian, and did not trouble himself about particulars.'

In explanation of the chronological difficulty, the confusion resulting from the use of *letters* as numerals in Hebrew MSS. has been urged; and this is notoriously a fertile source of error and contradiction, which rationalistic critics have not sufficiently kept in mind. To adduce such a reason, however, would be unavailing in the present case; for if it could be proved that the period stated in Exodus may have been abbreviated

through the negligence of some careless transcriber, or otherwise, and thus an approximation be made to the *fourteen* centuries of Bunsen, this would only place the writer of the Pentatench in more visible antagonism with St. Paul himself. The date of the exodus is fixed by Usher at B.C. 1491: by the Septuagint, at B.C. 1614; by Hales, at B.C. 1648; by Wilkinson, about B.C. 1495, in the reign of Thothmes III.; and by Bunsen, as late as B.C. 1320 or 1314, in the reign of Menephthah, in the latter of which years Manetho gives what appears to be the Egyptian version of the event. The genuineness and authenticity of the book of Exodus have been sharply criticised in modern times. The chronology is confused; but recent investigations indicate, as the probable date of the Exodus from Egypt, B.C. 1317, Apr. 15. Among the theologians who have questioned the integrity of Exodus are Von Lengerke, Stähelin, De Wette, Knobel, and Colenso, who find traces of an older and a later author, the former of whom they call Elohistic, and the latter Jehovistic. Their objections have been replied to by Hengstenberg and many others, who contend that the distinction is either artificial, or incapable of precise application. See PENTATEUCH: MOSES: JEWS.

EX OFFICIO: see under Ex.

EXOGAMY, n. *ĕks-ŏg′ă-mĭ* [Gr. *exō*, without; *gamos*, marriage]: the practice among certain savage peoples of always marrying out of the tribe (see TRIBE). EXOGAMOUS, a. *ĕks-ŏg′ă-mŭs*, pertaining to a tribal law among savages of always marrying from another tribe.

EXOGASTRITIS, n. *ĕks-ō-găs-trī′tĭs* [prefix *exo-*; Eng. *gastritis*]: in *pathol.*, inflammation of the external membrane of the stomach.

EXOGEN, n. *ĕks′ō-jĕn*, EX′OGENS, n. plu. *-jĕns* [Gr. *exo*, without; *gennăō*, I produce]: that division of the vegetable kingdom in which the plants grow by additions to the outside of the wood in the form of annual concentric layers, as in the oak, ash, elm, and other dicotyledons—distinguished from the *endogens*, those plants whose growth is from within outward. EXOG′ENOUS, a. *-ĕ-nŭs*, growing or increasing in size by annual additions to the outside, as in the oak, ash, etc.; in *anat*, growing out from a bone already formed.—*Exogenous plants* are those in which the woody substance of stem increases by bundles of vascular tissue added externally. The exogenous stem contains a central *Pith* (q.v.), from which *medullary rays* proceed to the Bark (q.v.), and the bark is easily separable from the woody part (see WOOD) which it surrounds. The exogenous is thus very different in structure and manner of growth from the endogenous or the acrogenous stem. Amid the cellular substance of the young stem, when it has developed itself from the seed, woody cords are seen connecting the cotyledons, and afterward the leaves,

when these appear, with the root, in the central axis of which they join. A section of the stem exhibits the cellular substance traversed by vascular bundles (wood and bast), which in the section are more or less wedge-shaped, radiating from the centre, but not prolonged into the centre itself, which, even to the greatest age of the stem, remains occupied by the cellular pith. Additional bundles are interposed, as growth proceeds, diminishing the proportion of cellular substance in the stem, yet without these bundles ever becoming so compacted together as to cut off the communication between the cellular centre of the stem and its bark, which is maintained by means of the medullary rays, often, indeed, imperceptible to the naked eye, but always present even in the hardest and most close-grained wood. The woody layers which are formed in successive years, as new leaves and branches are developed, are formed amid the *Cambium* (q.v.), into which the woody fibres of the new leaves descend, between the bark and the former wood. Thus the concentric circles are formed, usually one for each year's growth, distinguishable even in the most matured timber, and by which the age of trees is commonly computed. The beginning of each new layer is generally marked by a greater abundance of *pitted vessels*, the openings of which are conspicuous in the transverse section. In pines, the line of separation between the layers is marked by greater density of texture, and often by deeper color. The age of trees cannot, however, be calculated with perfect certainty from the concentric circles of the stem, as any circumstance which temporarily arrests the growth in any summer, may produce an effect similar to that ordinarily produced by the change of seasons; while in the trees of tropical countries, at least where the wet and dry seasons are not very marked, concentric circles are often not to be discovered.

The structure of the branch of an exogenous tree perfectly corresponds with that of the stem. The vascular bundles of the stem or branch form a loop where a leaf begins, and those of the leaf and its axillary bud spring from the loop. The roots of the exogenous plants have not a central pith like the stem, but in a few trees as the horse-chestnut the pith is prolonged to some extent into the root.

Anomalies are frequently seen in the structure of exogenous stems, particularly among the twining woody plants of tropical countries. There are also very many herbaceous plants, in which, though the structure agrees with that of an exogenous tree in its first year, no further development is ever attained; while in many, even this is very imperfectly reached; yet these are on other accounts unhesitatingly classed with exogenous plants. The exogenous stem and dicotyledonous seed are so constantly found together; and the term *exogenous*, designating a great division of the vegetable kingdom, is now

giving place to the term dicotyledonus (q.v.): see BOTANY. Exogenous plants are also characterized by a particular mode of germination, with reference to which they are called *exorhizal* [Gr. *exō*, outward; *rhiza*, a root], the radical simply lengthening, and not having to break through the coat of the embryo. The leaves of exogenous plants generally exhibit a network of veins, instead of the parallel veins characteristic of endogens, and a greater proportional breadth of leaf usually accompanies this reticulated venation.

Exogenous plants are far more numerous than endogens. The trees and shrubs of temperate and cold climates generally, are exogenous, as well as very many herbaceous plants of these parts of the world, and many trees, shrubs, and herbaceous plants of the tropics. Almost all trees, except palms and a few *Liliaceæ*, *Pandanaceæ*, and tree-ferns, are exogenous.

EXOGONIUM, n. *ĕks-o-gō′nĭ-ŭm* [Gr. *exo*, outside; *gonē*, that which engenders, because the stamens are exserted]: genus of *Convolvulacæ*, tribe *Convolvuleæ*. *Exogonium Purga*, a beautiful twiner, with long purple flowers, furnishes the best jalap.

EXOGYRA, n. *ĕks-o-jīr′a* [Gr. *exō*, outside; *guros*, a ring, a circle: so named because the beaks are reversed, that is, turned to the posterior side of the shell]: in *paleon.*, sub-genus of *Gryphœa*. Known species 46, ranging from the Oolite to the Chalk. They are found in the rocks of the United States and Europe.

EXOMPHALOS, n. *ĕks-ŏm′fă-lŏs* [Gr. *exō*, without; *omphălos*, a navel]: umbilical hernia; the protrusion of the intestine through the umbilicus.

EXON, n. *ĕks′ŏn:* an officer of the yeomen of the royal guard in England. EXONSHIP, n. *-shĭp*, the office or post of an exon of the royal body-guard. EXON-IN-WAITING, an officer of the royal guard in special attendance of the court.

EXON, a.: pertaining to Exeter cathedral or city.

EXONERATE, v. *ĕgz-ŏn′ĕr-āt* [L. *exŏnĕrātus*, freed from a burden—from *ex*, out of; *onĕrātus*, loaded; *onus*, a load: It. *esonerare:* F. *exonérer*]: to free from; to clear from blame; to cast off, as an obligation or charge on any one; to exculpate; to absolve. EXON′ERATING, imp. EXON′ERATED, pp. EXON′ERA′TION, n. *-ā′shŭn*, the act of freeing from a charge or from blame. EXONERATOR, n. *-tĕr*, one who exonerates another. EXON′ERATIVE, a. *-tĭv*, freeing from an obligation or from blame.—SYN. of 'exonerate': to acquit; clear; justify; discharge; unload; disburden; relieve.

EXOPHAGY, n. *ĕks-ŏf′a-jĭ* [Gr. *exō*, without, externally; *phagein*, to eat]: kind of cannibalism in which only persons of a different tribe are eaten. EXOPH′AGOUS, a. *-gŭs*, practicing exophagy.

EXOPHLÆUM, n. *ĕks-o-flē′ŭm* [Gr. *exō*, outside;

phloios, rind or bark of trees]: in bot., same as EPIPHLŒUM.

EXOPHTHALMOS, n. *ĕks'ŏf-thăl'mŏs,* or EX'OPHTHAL'MIA, n. *-thăl'mĭ-ă* [Gr. *exō,* without, outside; *ophthal'mos,* the eye]: great prominence of the eyes, in which the individual has a marked and peculiar stare. EX'OPHTHAL'MIC, a. *-thăl'mĭk,* of or pertaining to exophthalmia. EXOPHTHALMIC-GOITRE, n. in *med.,* a tumor on the fore part of the neck, caused by enlargement of the thyroid gland, and attended by protrusion of the eyeballs, anemia, and palpitation.

EXOPHYLLOUS, a. *ĕks-ŏf'ĭl-ŭs* [Gr. *exō,* outside; *phullon,* a leaf]: not evolved from a sheath, but outside all such protection; used of dicotyledons as distinguished from monocotyledons, the leaves of which are evolved from a sheath.

EXOPODITE, n. *ĕks-ŏp'ō-dīt* [Gr. *exō,* outside; *pous* or *poda,* a foot]: in *zool.,* the outer of the two secondary joints into which the typical limb of a crustacean is divided.

EXOPTILES, n. *ĕks-ŏp'tīl* [Gr. *exō,* outside; *ptilon,* feather, leaf, because the plumula is naked]: in *bot.,* name given by Lestibondois to *Dicotyledons.*

EXORBITANT, a. *ĕgz-ŏr'bĭ-tănt* [F. *exorbitant,* exorbitant— from mid. L. *exorbĭtăn'tem*—from L. *ex,* out of; *orbĭtă,* the track of a wheel, the impression of anything —from *orbis,* an orb or sphere]: deviating from the usual course; unreasonable; enormous; excessive. EXOR'BITANCE, n. *-tăns,* or EXOR'BITANCY, n. *-tăn-sĭ,* a going beyond due limits; enormity; excessive extravagance. EXOR'BITANTLY, ad. *-lĭ.*

EXORCISE, v. *ĕks'ŏr-sīz* [F. *exorciser*—from mid. L. *exŏrcĭzārĕ*—from Gr. *exŏrkĭzein,* to cause to swear, to conjure—from *ex,* intensive; *orkizein,* to bind by oath—from *orkos,* an oath]: to expel evil spirits by prayers and ceremonies, or by conjurations; to deliver from evil spirits; to adjure by a holy name. EX'ORCISING, imp. EX'ORCISED, pp. *-sīzd.* EX'ORCISER, n. *-sī-zĕr,* one who pretends to be able to cast out evil spirits. EX'ORCIST, n. *-sĭst,* one who. EX'ORCISM, n. *-sĭzm,* the act of exorcising; conjuration in the name of the heavenly powers; term used by the Fathers of the church to denote the act of conjuring evil spirits, in the name of God or Christ, to depart out of the person possessed. The first Christians adjured evil spirits in the name of Jesus Christ, who had conquered the devil; but as the opinion was at the same time entertained, that all idolaters belonged to the kingdom of Satan—who suffered himself to be worshipped under the form of idols—it was customary to exorcise heathens previous to their receiving Christian baptism. After Augustine's theory of original sin had found acceptance in the 5th c., and all infants were regarded as belonging to Satan's kingdom, exorcism

became general at the baptism even of Christian children. Following the practice of the Rom. Cath. Church Luther retained exorcism, but it was laid aside by the Reformed Church. Although abandoned by illustrious and orthodox Prot. theologians such as Chemnitz and Gerhard, or deemed unessential, and in modern times discarded by the 'Protestant' Church, the practice has been recently revived by the Old Luthern or High Church party.

In the Rom. Cath Church, the function of exorcism belongs peculiarly to one of the so-called 'minor orders'; see ORDERS. Our Lord having not only himself in person (Matt. ix. 32; Mk. i. 25; Lk. iv. 35; viii. 29) cast out devils, but having also given the same power to his disciples, it is believed to be permanent in the church. Of its exercise in the early church, both in relation to 'energumens,' or persons possessed, and in the administration of baptism, there are numerous examples. Tertullian and Origen speak of it as of ordinary occurrence, and the council of Carthage, 255, alludes to its use in baptism. The rite of exorcism is used by the modern church in three different cases: in the case of actual or appeal to the earliest examples of the administration of baptism, and in the blessing of the chrism or holy oil, and of holy water. Its use in cases of possession is now extremely rare, and in many diseases is prohibited, unless with the special permission of the bishop. In baptism it precedes the ceremony of applying the water and the baptismal form. It is used equally in infant and in adult baptism, and Rom. Cath. writers appeal to the earliest examples of the administration of the ordinance as evidence of the use of exorcism in both alike. The rite of baptismal exorcism in the Rom. Cath Church follows closely the Scriptural model, Mk. viii. 33. The exorcisms in the blessing of the oil and water resemble very closely the baptismal form, but are more diffuse.

EXORDIUM, n. *ĕgz-ŏr'dĭ-ŭm* [L. *exordĭŭm*, the warp of a web, a beginning—from *ex*, *ordĭŏr*, I begin a web, I begin: It. *esordia:* F. *exorde*]: the introductory part of a discourse, or of a written composition; the opening part of an oration or speech. EXOR'DIAL, a. *-ăl*, introductory.

EXORHIZAL, a. *ĕks'ō-rī'zăl* [Gr. *exō*, outside; *rhiza*, a root]: in *bot.* applied to those plants whose roots in germination proceed at once from the radicular extremity of the embryo, and do not burst through an outer coat. EXORHI'ZÆ, n. *-zē*, in *bot.*, name given by Richard to what are commonly called Exogens. The term is used because in germination the radicles have no sheaths at their base, but appear at once. Richard termed them also *Synorhizeæ*. EXORHIZOUS, same as EXORHIZAL.

EXOSKELETON, n. *ĕks'ō-skĕl'ĕ-tŏn* [Gr. *exō*, outside; *skĕlēton*, a dry body or mummy]: in *anat.*, the

hardened superficial tissues of external protection, as the crusts of crabs, the plates of reptiles, and the scales of fishes.

EXOSMOSE, n. *ĕks'ŏs-mōs* [Gr. *exō*, outside; *ōsmos*, a thrusting, an impulsion: F. *exosmose*]: EXOSMOSIS, the passing outward of a fluid through a membrane by diffusion—the passing inward from the outside is called *endosmose* (q.v.). EX'OSMOT'IC or EXOS'MIC, a. *mŏt'ĭk*, pertaining to.

EXOSPORE, n. *ĕks'ō-spōr* [Gr. *exō*, without; *spora*, a seed]: the outer covering or wall of a spore; that which may be compared to the extine of a pollen-grain. EXOSPOROUS, a. *ĕks-ŏs'pō-rŭs*, having naked spores as in fungi.

EXOSSATE, a. *ĕks-ŏs'sāt*, or EXOS'SATED, a. *-ĕd* [L. *exossatus*]: deprived of bones.

EXOSTEMMA, *ĕks-o-stĕm'ma:* genus of American trees and shrubs of the nat. ord. *Cinchonaceæ*, nearly allied to *Cinchona*. Several species yield febrifugal barks, which, however, do not contain the chincona alkaloids. The most valued of these barks are Caribbee Bark (q.v.) and Saint Lucia Bark, the latter of which is the produce of *E. flori bunda*, native of the more mountainous parts of the W. Indies.

EXOSTOME, n. *ĕks'ŏs-tōm* [Gr. *exō*, outside; *stoma*, a mouth]: in *bot.*, the outer opening of the foramen of the ovule.

EXOSTOSIS, n. *ĕks'ŏs-tō'sĭs* [Gr. *exostōsis*, a bony excrescence—from *ex*, out of; *ostĕŏn*, a bone: F. *exostose*] in *anat.*, an unnatural projection or growth from a bone (see TUMOR); in *bot.*, a wart-like excrescence.

EXOTERIC, a. *ĕks'ō-tĕr'ĭk*, or EX'OTER'ICAL, a. *-ĭ-kăl* [Gr. *exōterĭkos*, external; *exōtĕrŏs*, exterior—from *exō*, outside: L. *exōtĕrĭcŭs:* It. *esoterico:* F. *exotérique*]: public; external; opposed to *esoteric* or secret (see ESOTERIC); professed or taught openly. EX'OTER'ICISM, n. *-sĭzm*, exoteric doctrines or principles.

Those writings of Aristotle which were written in dialogue form, and intended for general readers were called *exoteric;* his more technical works, designed more for his own pupils, were *esoteric.* The Pythagoreans, and possibly other schools, presented general *exoteric* teachings to the general public, but reserved a body of *secret esoteric* doctrine to advanced initiates.

EXOTHECIUM, n. *ĕks'ō-thē'shī-ŭm* [Gr. *exō*, without; *thēkē*, a case or sheath]: in *bot.*, the outer coat of the anther.

EXOTIC, n. *ĕgz-ŏt'ĭk* [Gr. *exōtĭkŏs*, foreign, strange—from *exō*, outside: L. *exōtĭcŭs:* [F. *exotique*]: a plant, shrub, or tree introduced from a foreign country; something foreign: ADJ. foreign; not native; also EXOT'ICAL, a. *-ĭ-kăl.* EXOT'ICISM, n. *sĭzm*, state of being exotic.

Note.—Indigenous, the opposite of *exotic,* means naturally belonging to a region.—*Exotics* or *Exotic plants* are usually those of which the native country differs so much in soil or climate from that into which they have been conveyed, that their cultivation is attended with difficulty, requiring artificial heat or other means different from those requisite in the case of indigenous plants. Some exotics seldom flower in their new home; and of those that flower, some never ripen their fruits and seeds.

EXPAND, v. *ĕks-pănd′* [L. *expandĕrĕ,* to spread out—from *ex,* out of; *pando,* I open or spread: It. *espandere*]: to open; to spread out or enlarge a surface; to extend; to dilate. EXPAND′ING, imp. EXPAND′ED, pp. EXPANSE′, n. *-păns* [L. *ex, pansŭs,* spread]: a wide extent of space or body; extent; a spreading. EXPAN′SIBLE, a. *-ăn′sĭ-bl,* capable of being extended. EXPAN′SIBLY, ad. *-blĭ.* EXPAN′SIBIL′ITY, n. *-bĭl′ĭ-tĭ,* capacity of extension in surface or bulk. EXPAN′SION, n. *-shŭn* [F.—L.]: act of expanding; state of being expanded; the enlargement of the surface or size of a body; extension (see HEAT). EXPAN′SIVE, a. *-sĭv,* widely extended; having the power to dilate or spread out; having the capacity of being expanded. EXPAN′SIVELY, ad. *-sĭv-lĭ.* EXPAN′SIVENESS, n.—SYN. of 'expand': to enlarge; distend; spread; diffuse.

EXPANSION, in physics, is the increase in the bulk of bodies, in consequence of a change in their temperature. This is one of the most general effects of heat, being common to all bodies whatever, whether solid or fluid. The expansion of solid bodies is determined by the pyrometer, and that of fluids by the thermometer. The expansion of fluids varies considerably, but, in general, the denser the fluid, the less the expansion; thus water expands more than mercury, and spirits of wine more than water; and, commonly, the greater the heat, the greater the expansion; but this is not universal, for there are cases in which expansion is produced, not by an increase, but by a diminution of temperature. Water furnishes us with the most remarkable instance of this kind. Its maximum of density corresponds with 39.2° F. This fact is of the utmost importance in the economy of nature. When the surface of rivers and lakes is cooled, the superior layer of water sinks, and warmer water from below takes its place till the whole mass is cooled to 40°. After this the circulation ceases, and ice is formed. The maximum density point of sea water is considerably lower than that of fresh water, and varies with the quantities of the salts contained in it. The expansion of water is about the same for any number of degrees above or below the maximum density point. Thus, if we heat water 5° above 39.2°, it occupies the same bulk as it does when cooled down to 5° below 39.2°: and

the density of water at 32° and at 53° is very nearly the same. The force with which water expands in the act of freezing is shown when glass bottles are filled with water and sealed; the glass is broken in pieces when the water freezes. A brass globe, whose cavity is an inch in diameter, may be burst by filling it with water and freezing it; and the force necessary for this effect is 27,720 pounds weight. The expansive force of freezing water may be explained by supposing in the consequence of a tendency which water in consolidating is observed to have to arrange its particles in one determinate manner, so as to form prismatic crystals, crossing each other at angles of 60° and 120°. The force with which they arrange themselves in this manner must be enormous, since it enables small quantities of water to overcome so great mechanical pressures. This observation is conspicuously illustrated by observing the crystals of ice on a piece of water exposed to the action of the air in frosty weather; or upon a pane of glass in a window of a room without a fire at the same season. Various methods have been tried to ascertain the specific gravity of ice at 32°; that which succeeded best was to dilute spirits of wine with water till a mass of solid ice put into it remained in any part of the liquid without either sinking or rising. The specific gravity of such a liquid is 0.92, which, of course, is the specific gravity of ice, supposing the specific gravity of water at 60° to be 1. This is an expansion much greater than water experiences even when heated to 212°, its boiling-point. We see from this that water at the instant of solidification receives a sudden and considerable augmentation of bulk.

EX PARTE, a. *ĕks' pâr'tē* [see under Ex]: in *law*, executed by one side only; in *common conversation*, that which is related on one side only of the matter, as, an *ex parte* statement; one-sided.

EXPATIATE, v. *ĕks-pā'shĭ-āt* [L. *exspătĭātus*, extended, spread out—from *ex*, out of; *spătĭŏr*, I wander or walk about]: to enlarge on a subject in speech or writing; to be copious in discussion. EXPA'TIATING, imp. EXPA'TIATED, pp. EXPA'TIA'TION, n. *ā'shŭn*, a wandering at large. EXPA'TIATORY, a. *-ă-tēr-ĭ*.

EXPATRIATE, *ĕks-pā'trĭ-āt* [mid. L. *expātrĭātus*, banished—from L. *ex*, out of; *pătrĭă*, one's country: F. *expatrier*, to banish]: to banish from one's native- land. EXPA'TRIATING, imp. EXPA'TRIATED, pp. banished. EXPA'TRIA'TION, n. *-ā'shŭn*, banishment from one's native country, voluntary or otherwise, but understood usually as voluntary. Expatriation, in international law, is the principle by which an individual, the subject or citizen of one country, is allowed to adopt another citizenship or national character. The right of a citizen of one country to renounce his allegiance in order to adopt another country as his own, has and

is still much disputed. It seems most reasonable that the mother country and not the individual should decide the question. In the early part of the 19th century the United States was almost the only nation that claimed for individuals the right of expatriation without the consent of the government of which they were citizens or subjects. The European nations, as a rule, maintained that the permission of the sovereign was necessary; and the enforcement by England of this claim was one of the causes of the War of 1812. The right of voluntary renunciation of allegiance to the United States by one of our citizens was unsettled, so far as legislation was concerned, till the Act of Congress of 1868 July 27, asserted that expatriation 'is a natural and inherent right of all people,' but the action of the department of State had previously seemed practically to admit the right. The first formal recognition of this principle was secured in an expatriation treaty with the North German Confederation, signed 1868, Feb. 22. England first recognized the right of voluntary expatriation by act of Parliament in 1870, and immediately concluded an expatriation treaty with the United States. All the leading nations of Europe now recognize the right, including besides those just mentioned, France, Austria, Russia, Italy, and Spain. The laws of the various nations upon this subject have been published by the United States government, under the title *Opinions of the Principal Officers of the Executive Department and other Papers, Relating to Expatriation, Naturalization, and Change of Allegiance* (Washington 1873). See also CITIZEN; NATURALIZATION.

EXPECT, v. *ĕks-pĕkt'* [L. *expĕctārĕ*, to await, to expect—from *ex*, out of; *specto*, I look at. It. *espettare*] to look out for; to wait for; to have an apprehension of something future; to entertain a belief that something will happen; to demand or require. EXPEC'TING, imp. waiting or looking for the arrival of. EXPEC'TED, pp.: ADJ. looked for; apprehended. EXPEC'TANT, n. *spĕk'tănt* [F.—L.]: one possessed of the belief or hope that he will at some future time receive something good; ADJ. waiting; looking for. EX'PECTA'TION, n. *-tā'shŭn* [F.—L.]: the act of looking forward to; the state of expecting; the prospect of good to come; mean duration of life; value of a contingency (see PROBABILITY). EXPECTATION WEEK, week or period between Ascension Day and Pentecost Day, because during this time the apostles continued praying in earnest expectation of the Holy Spirit as promised. EXPEC'TANCY, n. *-tăn-sĭ*, something expected; a looking for with pleasure. also EXPEC'TANCE, n. *-tăns*. EXPEC'TINGLY, ad. *-lĭ*. EXPEC'TATIVE, a. *-tă-tĭv* [F.—L.]: constituting an object of expectation. EXPEC'TER, n. one who.—SYN. of 'expect': to wait; await; anticipate; look for; hope; think; believe; trust.

EXPECTATION, in Medicine, treatment of disease without active remedies, by merely observing its progress and averting its consequences through physiological means; as, for instance, when a fracture (q.v.) is treated by keeping the ends of the broken bone in their proper place, until the natural processes of repair are completed. Expectation is in this and other cases obviously a quite different thing from inaction, or the systematic doing of nothing with which it has been sometimes confounded.

EXPECTORATE, v. *ĕks-pĕktō′rāt* [L. *expĕctŏrātus*, expelled from the breast—from *ex*, out of; *pectus*, the breast; F. *expectorer*]: to eject matter from the air-passages by coughing and spitting; to cough up. EXPEC′TORATING, imp. EXPEC′TORATED, pp. EXPEC′TORA′TION, n. *-rā′shŭn* [F.—L.]: the act of discharging matter from the air-passages; the phlegm or mucus ejected by coughing: its examination is of the utmost value in diseases of the chest. EXPEC′TORANT, n. a medicine that promotes discharges from the bronchial tubes; such medicines are Antimony, Squill, Ipecacuanha, Senega, Balsam of Tolu, Lobelia, Gum ammoniac, Asafœtida and Galbanum. ADJ. that promotes the discharge of mucus from the air passages. EXPEC′TORATIVE, a. *-tĭv*, having the quality of promoting expectoration.

EXPEDE, v. *ēks-pēd′* [F. *expédier*—from L. *expĕdīrĕ*, to let loose]: in *Scotch law*, to dispatch; to expedite. EXPE′DING, imp. EXPE′DED, pp.

EXPEDIENT, a. *ĕks-pē′dĭ-ĕnt* [F. *expédient*—from L. *expĕdĭĕn′tem*, letting loose, extricating—from *ex*, *pĕdēs*, the feet: It. *espediente*]: fit or suitable for the purpose; tending to promote some end; proper or necessary under the circumstances; N. a contrivance or shift; that which serves to promote or help forward any end or purpose. EXPE′DIENCE, n. *-ĕns*, or EXPE′DIENCY, n. *-ĕn-sĭ*, suitableness for the end or purpose intended: propriety under the particular circumstances of a case advantage.—SYN. of 'expedient, n. and expediency, n.; resource; shift; contrivance; self-interest; resort; substitute; means.

EXPEDITE, v. *ĕxs′pēdīt expedītus*, loosed, set free —from *ex*, out of, *pĕdēs*, the feet]: to quicken; to hasten; to facilitate the doing of anything: ADJ. easy; nimble; active. EX′PEDITING, imp. EX′PEDITED, p. EX′PEDITELY, ad. *-lĭ*, readily; hastily. EX′PEDI′TION, n. *-dĭsh′ŭn* [F.—L.]: speed; quickness; march of an army for a hostile purpose; voyage of a ship or ships for any particular purpose; an enterprise or undertaking by a number of persons, the persons who form the undertaking. EX′PEDI′TIONARY, a. *er-ĭ*, consisting in an expedition. EX′PEDI′TIOUS, a. *-ŭs*, speedy, hasty; active; nimble. EX′PEDI′TIOUSLY, ad. *-lĭ*. SYN. of 'expedite, v.': to accelerate speed; dispatch; urge; instigate,—of 'expeditious'; ready; prompt; alert; quick.

EXPEL, v. *ĕks-pĕl′* [L. *expellĕrĕ*, to thrust out or away—from *ex*, out of; *pello*, I drive: It. *espellere*]: to drive or force out; to force to leave; to eject; to throw out; to exclude; to banish; to dismiss a student from a school or college. EXPEL′LING, imp. EXPELLED′, pp. *-pĕld′*. EXPEL′LABLE, a. *-lă-bl*, that can be driven out.

EXPEND, v. *ĕks-pĕnd′* [L. *expendĕrĕ*, to weigh out, to spend money—from *ex*, out of; *pendo*, I weigh]: to lay out; to spend; to employ; to use. EXPEND′ING, imp. EXPEND′ED, pp. EXPEN′DITURE, n. *-pĕn-di-tur*, a laying out, as of money, time, or trouble; that which is thus expended; disbursement. EXPENSE′, n. *-pĕns′* [L. *expensus*, weighed out]: cost; charges; a laying out, as of money; a consuming, as of labor or time; that which is used or consumed. EXPENSE′LESS, a. without cost. EXPEN′SIVE, a *-sĭv*, costly; high-priced; extravagant; given to expense. EXPEN′SIVELY, ad. *-lĭ*. EXPEN′SIVENESS, n. costliness.—SYN. of 'expense'; price; value; worth; disbursement; outlay; consumption.

EXPENS′ES (or COSTS) OF A LAW′SUIT: charges exigible from the parties to lawsuits. For the arrangements adopted in England, and for the usage in the United States, see COSTS. In Scotland, these charges are commonly spoken of as expenses; and the pursuer of an action at law in Scotland almost always asks the court to pronounce decree in his favor for the expense of the proceedings which he has found it, or may find it, necessary to institute. On the other hand, the defender usually demands the expense attending his defense; and the general rule is, that the party found ultimate in the wrong has decree pronounced against him for the expense which he has occasioned to his opponent, as well as for the subject-matter of the suit. As it is quite usual for a party to succeed in one branch of his action, and to fail in another; or to occasion unnecessary expense by the unskilful or careless mode in which he conducts some portion of it, even though on the whole he be in the right; the adjustment of the amounts incurred by the parties respectively often involves not only much nicety of calculation, but questions of considerable legal difficulty: see AUDITOR and SHERIFF.

EXPERIENCE, n. *ĕks-pē′rĭ-ĕns* [F. *expérience*—from L. *experĭĕn′tĭă*, practice, experience—from *expĕrĭŏr*, I try, I put to the test]: knowledge gained by frequent trial or by experiment; practice; knowledge from observation. V. to try to know by practice or experiment; to know by trial. EXPE′RIENCING, imp. EXPE′RIENCED, pp. *-ĕnst:* ADJ. taught by practice or by repeated observations; skilful by means of trial and use. EXPE′RIEN′TIAL, a. *-ĕn′shăl*, derived from experience. EXPERIEN′TIALISM, n. *-shăl-ĭzm*, in *ment. phil.*, doctrine that all our ideas are derived from the experience of

ourselves or of others, and that there are no intuitions. It has been called also Sensationalism. EXPERIEN'TIALIST, a. *-ĭst*, pertaining or relating to experientialism: N. one holding this doctrine.

EXPERIENCE (in philosophy): This term is used so ambiguously in philosophy that a definition of it for the layman is hardly practicable. It applies to the consciousness of an individual considered either as a whole, e.g. 'my experience teaches me so and so,' or as a special moment of mental life, e.g. 'this experience is agreeable.' The term is also applied to the entire field of psychic life. In this sense it is the material whence come all specific experiences of all individuals. One of the most familiar distinctions met with is that between outer and inner experience, a distinction which in its usual form modern criticism is disposed to regard as untenable. The purport of the distinction itself is by no means clear or consistent, but it refers ordinarily to cases in which on the one hand events are thought of as belonging to some person (inner), or as belonging to the realm of phenomena common to everyone (outer). The world in space and time would belong to outer experience so considered. The thoughts and feelings of the reader would represent the sphere of inner experience. In point of fact those two zones of experience over-lap and run together so inextricably, that the distinction described is found on critical scrutiny to be of highly precarious stability. Contemporary philosophers—specially pragmatists (see Pragmatism)—are wont to use the term to indicate the unanalysed matrix out of which in the development of the reflective consciousness of the individual are evolved all the distinctions which thought makes in carrying on its enterprises and particularly the distinction between mind and matter (q.v.). In this usage the term thus becomes the fundamental concept in philosophy.

EXPERIMENT, n. *ĕks-pĕr'ĭ-mĕnt* [F. *expérimenter*, to experience—from mid. L. *experĭmentārĕ*, to prove, to try; L. *expĕrimĕntum*, a proof, a trial]: a trial or operation for the purpose of discovering something unknown; a trial to confirm or disprove something doubtful: V. to search by trial. EXPER'IMENTING, imp. making trials. EXPER'IMENTED, pp. searched out by trial or experiment. EXPER'IMEN'TIST, n. one who. EXPER'IMEN'TAL, a. *-tăl* [F.—L.]: known by trial or experiment. EXPER'IMEN'TALLY, ad. *-lĭ*. EXPER'IMEN'TALIST, n. one who makes experiments. EXPER'IMENTA'TION, n. *-tāshŭn*, exercise or practice in experiment. EXPER'IMEN'TATIVE, a. *-mĕn'tă-tĭv*, experimental. EXPER'IMENTER, n. one who. EXPER'IMEN'TUM CRU'CIS, *-mĕn'tŭm krô'sĭs* [L. *crucis*, of a cross—from *crux*, a cross]: a decisive or crucial experiment—SYN. of 'ex-

periment, n.: proof; test; effort; attempt, endeavor; essay, trial; exertion; experience; operation; act.

EXPERIMENT AND OBSERVATION: means by which we extend and confirm our knowledge of nature. An experiment is properly a proceeding by which the inquirer interferes with the usual course of a phenomenon, and makes the powers of nature act under conditions that, without his interference, would never, perhaps have presented themselves all together. The introduction of experiment distinguishes the modern method of investigating nature from that of ancient times and of the middle ages. It is through experiment that physics and chemistry have made such rapid strides within the last two centuries. Through experiment, the investigator becomes master of the phenomena that he is considering; for he can contrive to set aside the unessential circumstances that so often conceal the real relations and conditions of things, and so can bring these out into the light. Experiments exhibited not for discovery of truth, but to aid in the exposition of truths already discovered, are sometimes called demonstrative experiments.

EXPERIMENT STATIONS, WORK OF. The agricultural experiment stations of the United States government now form the most complete system of agricultural research in the world.. Over 1,000 trained and practical men are now employed in the 60 stations, which are now in operation in every State and Territory, including Alaska, Hawaii, Porto Rico and the Philippines. The annual income of these stations in 1902 was $1,328,847, of which sum $720,000 came from the Federal government, and $608,847 from State appropriations and other sources. The stations have existed as a national enterprise for 14 years, and the outlay for agricultural investigation in that time has been at the rate of $1 for nearly $3,000 worth of farm products, which cannot be considered an extravagent outlay.

Our farmers spend over $50,000,000 a year for fertilizers, and the stations have given particular attention to this subject. Fraud and extravagant assertions about fertilizers have been largely eliminated from the business and thousands of farmers are buying fertilizers more intelligently and economically. The annual loss to farmers from waste of barnyard manure is estimated at $7,000,000. Many of the stations have given special attention to the economic use of manure on the farm, with the result that better methods for its care and use are being employed. The successful introduction of Mansury barley, for which the Wisconsin station is mainly responsible, has increased the yield of barley over a wide region, with results worth millions of dollars. Kaffir corn was introduced about 15 years ago by the stations in California, Kansas and Oklahoma. It has been found specially suited to regions of scanty

rainfall. The crop in Kansas alone is valued at over $6,000,000.

The various macaroni wheats which have been tested under varying conditions by a number of the stations, have proved so successful that the United States will probably produce all the macaroni it consumes in the course of a few years. The investigations of the experiment stations in the southern States have convinced farmers that many varieties of forage plants may be more successfully grown in the South than was supposed and have laid the foundation for a wide development of the live stock and dairy industries of that region. The department of agriculture and the Connecticut State station, co-operating with local tobacco growers, have within the last three years demonstrated that a fine grade of Sumatra wrapper tobacco may be grown under shade in the Connecticut valley. Prof. Whitney says that this discovery will increase the value of the light lands of the Connecticut valley over 200 per cent. The stations of the northwestern States have extended the limits of corn culture by proving, by careful selections of varieties and modified methods of culture, that this crop may be grown in regions heretofore believed to be unsuited to corn culture. The stations have been prominent in the investigations which have led to the new system of forcing vegetables in the field and under glass for supplying the markets with fresh vegetables at all seasons of the year. For example, the winter culture of lettuce in eastern North Carolina is now yielding over $100,000 a year. The Ohio station discovered that onions started in the greenhouse or under frames from seed and then transplanted to the open field produce larger onions and earlier and heavier crops than by the usual methods of tillage and seeding. This discovery is changing the methods of onion culture.

These are only a few of the many ways in which the experiment stations are helping agriculture. Their investigations relating to protective measures against plant diseases and injurious insects, the storage and utilization of fodder crops, breeding and dairying, the protection of farmers against fraud, and many other topics have been of the utmost value.

EXPERT, a. *ĕks-pėrt′* [F. *expert*, skilful—from L. *expertus*, tried, proved]: ready; dexterous; skilful by practice: N. *ĕks′pėrt*, one skilled in a science, an art, or a profession; a scientific or professional witness: usually medical or scientific witnesses in a court of justice, selected for special qualifications, as in the case of an analysis of the contents of the stomach in suspected poisoning. The term is applied similarly to a person professionally skilled in handwriting, for detection of forgery of deeds and signatures. EXPERT′LY, ad. *-lĭ*. EXPERT′NESS, n. skill, readiness.—SYN. of 'expert a.': adroit; skilful; prompt.

EXPIATE, v. *ĕks'pĭ-āte* [L. *expĭātŭs*, made complete satisfaction for—from *ex*, out of; *pĭātus*, propitiated: It. *espiare:* F. *expier*]: to make reparation or satisfaction for; to atone for. EX'PIATING, imp. EX'PIATED, pp. EX'PIABLE, a. *-ă-bl*, that may be atoned for. EX'PIA'TION, n. *-ā'shŭn* [F.—L.]: the act of making satisfaction for a crime by which the guilt is done away; atonement; satisfaction; the means by which the atonement is made. EX'PIA'TOR, n. *-tėr*, one who. EX'PIA'TORY, a. *-ā'tėr-ĭ*, having power to make atonement.

EXPIRE, v. *ĕks-pīr'* [F. *expirer*—from L. *exspīrārĕ*, to breathe or blow out—from *ex*, out of; *spīrō*, I breathe]: to breathe out; to exhale; to breathe the last breath; to die; to fail or be destroyed. EXPI'RING, imp. breathing out: ADJ. dying; ending; pertaining to, or uttered at, the time of dying. EXPIRED', pp. *-pīrd'*. EXPI'RABLE, a. *-ră-bl*, that may come to an end. EX'PIRA'TION, n. *-pĭ-ră'shŭn* [F.—L.]: the act of forcing the air from the lungs; exhalation; conclusion; termination of a limited time. EXPI'RATORY, a. *-pī'ră-tėr-ĭ'* pertaining to the emission of air from the lungs. EXPIRY, n. *ĕks-pī'rĭ*, the termination or end.

EXPISCATE, v. *ĕks-pĭs'kāt* [L. *expĭscātus*, searched out—from *ex*, out of; *piscis*, a fish]: to search out by artful means; to discover; to investigate. EXPIS'CATING, imp. EXPIS'CATED, pp. EX'PISCA'TION, n. *-kā'shŭn*, a thorough search or investigation.

EXPLAIN, v. *ĕks'plān'* [OF. *explaner*, to expand, to explain—from L. *explānārĕ*, to make plain or clear—from *ex*, out, and *plānus*, smooth, plain, evident]: to make plain or evident; to clear of obscurity; to expound. EXPLAIN'ING, imp. EXPLAINED', pp. *-plānd'*. EXPLAIN'ABLE, a. *-ă-bl*, capable of being made plain to the understanding. EX'PLANA'TION, n. *-plă-nā'shŭn*, the act of explaining; an exposition; an interpretation; sense explained; a mutual clearing up of a misunderstanding. EXPLAN'ATORY, a. *-plăn'ă-tėr-ĭ*, serving to explain; containing an explanation. EXPLAIN'ER, n. one who. EXPLANATE, a. *ĕks'plā-nāt*, in *entom.*, having the sides of the prothorax so depressed and dilated as to form a broad margin.—SYN. of 'explain': to expiscate; elucidate; illustrate; interpret; clear up; define; describe; explicate; recite; recount; detail.

EXPLETIVE, a. *ĕks'plē-tĭv* [F. *explétif*—from L. *explētīvus*, filling up—from *ex*, out of; *plĕō*, I fill]: filling up or out; added for supply or ornament; not necessary to the sense: N. a word or syllable inserted for ornament, or only used to take up room; *colloquially*, a coarse or profane word. EX'PLETORY, a. *-tėr-ĭ*, serving to fill up.

EXPLICATE, v. *ĕks'plĭ-kāt* [L. *explĭcātus*, unfolded or spread out—from *ex*, out of; *plĭcō*, I fold: It. *esplicare:* F. *expliquer*]: to interpret; to explain; to clear of difficulties. EX'PLICATING, imp. EX'PLICATED,

pp. Ex'plicator, n. *-tĕr*, one who. Ex'plicable, a. *-kă-bl*, that may be explained or interpreted. Ex'plica'tion, n. *-kă'shŭn* [F.—L.]: interpretation; explanation. Ex'plica'tive, a. *-kā'tĭv*, or Ex'plica'tory, a. *-tĕr-ĭ*, serving to explain or interpret.

EXPLICIT, a. *ĕks-plĭs'ĭt* [F. *explicite*—from L. *explĭcĭtus*, disentangled, free from obstacles (see Explicate)]: clear; plain; not ambiguous or obscure. Explic'itly, ad. *-lĭ*. Explic'itness, n. clearness or plainness in language. Explicit function, n. in *math.*, a function whose value is expressed directly in terms of the variable.—Syn. of 'explicit': express; unreserved; open; unambiguous; explanatory; unobscure.

EXPLODE, v. *ĕks-plōd'* [OF. exploder, to explode—from L. *explōdĕrĕ*, to drive out or off by clapping—from *ex*, out of; *plaudo*, I clap the hands in token of approbation—*lit.*, to drive out by clapping the hands]: to burst forth with sudden violence and noise; to change instantaneously into the gaseous state with enormous force; to burst with force and a report, as gunpowder; to drive from notice; to cry down, as a fashion or an opinion. Explo'ding, imp.: Adj. having the property of bursting forth with violence and noise. Explo'ded, pp.: Adj. rejected; condemned; burst violently. Explo'der, n. one who. Explo'sion, n. *-plō'zhŭn* [L. *explōsŭs*, driven off by clapping the hands: F. *explosion*]: a bursting forth with violence and noise; a sudden expansion with noise, the result of a change into the gaseous state; that which is thus exploded; the noise itself. Explosive, n. *ĕks-plō'sĭv*, a substance such as gunpowder or dynamite, which, by contact with heat or by means of friction, is instantaneously changed into the gaseous state with immense force: Adj. having a tendency to explode, having the property of exploding. Explo'sively, ad. *-lĭ*. Explo'siveness, n. liability to explode.

EXPLOIT, n. *ĕks-ployt'* [F. *exploit*, an exploit: OF. *exploit*, revenue, profit—from L. *explĭcitārĕ* for *explĭcārĕ*, to unfold, to spread out; *explĭcĭtus*, unfolded]: an act or a deed, especially a heroic one; an achievement; a deed of renown. Exploitation, n. *ĕks'ploy-tā'shŭn*, or Exploit'ing, n. [F. *exploitation*—from *exploiter*, to perform a feat]: improvement of lands by cultivation, the felling of wood, the working of mines, and similar undertakings; the examination instituted for that purpose. Exploit'ed, a. searched out and seized, as by an armed party.

EXPLOITS, *ĕks-ployts'*, River of: chief water-course of Newfoundland; flowing from s.w. to n.e. nearly the whole breadth of the island into Exploit Bay; length 150 m. It is navigable for steamboats to the rapids, 12 m. from its mouth, and from that point by small boats within 50 m. of the s.w. coast. It drains about 3,000

sq. m., nearly all the habitable land of the interior. Its valley is rich, and has abundance of timber, game, and fish.

EXPLORE, v. *ĕks-plōr'* [F. *explorer*—from L. *ex-plōrārĕ*, to search out, to seek to discover—from *ex*, out of; *plōrō*, I cry out: It. *esplorare*]: to search into or examine closely with the eye in order to discover; to examine thoroughly, as to *explore* new countries; to search by any means; to try to find out. EXPLO'RING, imp. EXPLORED', pp. *-plōrd'*. EXPLO'RER, n. one who penetrates a new country for the purpose of thorough examination; also EX'PLORA'TOR, n. *-plō-rā'tĕr*, one who, EX'PLORA'TION, n. *-shŭn* [F.—L.]: close search; strict examination. EXPLOR'ATORY, a. *-ă-tĕr-ĭ*, serving to explore; searching out.—SYN. of 'explore': to search; examine; investigate; inspect; scrutinize; seek; penetrate. See POLAR EXPEDITIONS; ARCTIC OCEAN; ANTARCTIC OCEAN, etc.

EXPLOSIVES. The popular idea of an explosive is something which will burn up instantaneously without requiring air to support its combustion, and which may, therefore, be fired in a confined space. An explosive is, in reality, a body whose elements are capable of reacting with one another with the evolution of gas and heat.

Explosives generally consist of some combustible element or elements, and some oxidizing elements capable of furnishing the oxygen to burn the combustible elements. In some explosives, as in ordinary black gunpowder, the combustible elements, charcoal and sulphur, are simply mechanically mixed with saltpetre, the oxidizing element. In nitroglycerin and in guncotton, however, the combustible and oxidizing elements are chemically combined.

There are, practically, two kinds of explosive compounds—the high explosive or detonating explosive, such as dynamite; and gunpowder, known as a combustive explosive. High explosives are consumed by a form of wave action and are said to detonate because they explode practically instantly; while gunpowder is consumed by surface combustion and at a rate which depends upon the hardness of the grains and their size, and the conditions of confinement under which the powder is fired. The greater the confinement and the smaller and more friable the grain, the more rapid is the explosion.

Gunpowder.—Black gunpowder is an explosive consisting of a mechanical mixture of sulphur, saltpetre, and charcoal. There are two main purposes for which gunpowder is employed—as a propellent for throwing projectiles from guns, and as a blasting agent.

Little is known as to the origin of gunpowder. We have well authenticated records of its use by the ancients. It was first employed as a sort of rocket material and was used mainly for frightening an enemy

and for setting fire to buildings and ships. The famous Greek fire was doubtless some form of gunpowder mixed with bitumen. In time it was discovered that projectiles, as well as the rocket itself, could be thrown from the rocket-ejecting tubes. True projectiles, however, were probably not employed until long after the Christian era. The first authentic account of their use was in the siege of Constantinople by Mahomet II., when stones weighing 600 pounds were thrown from powder guns.

The name gunpowder is at the present time a misnomer, as the material is no longer employed in the form of a powder, but is made granular, the grains varying in size according to the use for which the powder is to be employed, a very fine grain being used in shot guns and small rifles, while the grains of some powders for heavy cannon are as large as 1½ in. in diameter.

Gunpowder was first granulated in 1525. The next most important improvement in the granulation of gunpowder was the prismatic powder of General Rodman, made in 1854. Gen. Rodman was the first both to perforate and to multiperforate gunpowder grains. However, as black gunpowder did not well lend itself to the multiperforated form of grain, the general form of prismatic grain, before the advent of smokeless powder, contained but a single central perforation. The object of the perforation and multiperforation was to make a powder which would burn with acceleration and thereby better maintain the pressure of the powder gases behind the projectile in its flight through the gun.

It was found, however, that no matter what care was taken in granulation, and regardless of the size or form of the powder grain, the simple black gunpowder mixture was too quick for use in large guns. This led to the invention of what is known as brown prismatic powder, which, previous to the advent of smokeless powder, came into general use.

Brown prismatic, or cocoa powder, is composed of a mixture of sulphur, saltpetre, and partially carbonized charcoal, made by baking either wood or straw until reduced to a dark coffee color. This charcoal retains some carbo-hydrates, whereas in the black charcoal the carbo-hydrates are entirely driven off. Some manufacturers add a certain percentage of carbo-hydrates to the mixture.

The first form of brown or cocoa powder consisted of 79 parts saltpetre, 18 parts brown charcoal, and 3 parts sulphur, the charcoal being made from straw. An improved form of this powder consisted of 79 parts saltpetre, 4 parts sulphur, 4 parts carbo-hydrates, and 13 parts baked wood.

Owing to the low percentage of sulphur, brown prismatic powder ignites much less rapidly than common black gunpowder, and for the same reason burns much

more slowly in the gun, while the large volume of gases set free by the decomposition of the carbo-hydrates, together with the slower-burning qualities of the powder, enables the attainment of higher ballistics than with the old black powder, for the reason that the pressure is better maintained behind the projectile in its flight through the bore of the gun.

Furthermore, the brown prismatic powder grains are subjected to great hydraulic pressure, which has the effect of making the grains much harder and denser on each end and less dense in the middle. The effect of this is to cause the powder grain to burn with an increasing area around its periphery, while the grain burns more slowly at the hard ends. The central perforation also tends to give acceleration to the combustion of the grain.

A large amount of experimenting has been conducted, both by individuals and by the various governments, to ascertain the best proportions of the ingredients for black gunpowder, and although these proportions are varied by different manufacturers, the composition of black gunpowder the world over is pretty nearly the same, and consists of about 75 per cent. saltpetre, 10 per cent. sulphur, and 15 per cent. charcoal. It is necessary that the ingredients be well purified; especially must the saltpetre be freed from chloride of sodium, known as common salt, for its presence renders the powder hygroscopic. The saltpetre is very easily purified by recrystallization from saturated solutions in hot water, as the saltpetre is many times more soluble in hot than in cold water. The woods yielding the best charcoal have been found to be black alder, poplar, spindle tree, willow, and dogwood.

The products of combustion of blackpowder consist of about 56 parts solid matter, while only about 44 parts are gaseous. The composition of the solids and gases is substantially as follows:

K_2CO_3	33.1	
K_2SO_4	7.1	
K_2S	10.	
S	4.4	
KCyS	0.14	
$(NH_4)_4(CO_2)_3$	0.05	
Charcoal	0.08	
KNO_3	0.13	
Total solid products		55.0
CO_2	26.6	
CO	4.8	
N	11.5	
H	0.06	
H_2S	1.1	
CH_4	0.06	
Total gaseous products		44.1
H_2O		.95

Process of Manufacture.—The ingredients are first pulverized and thoroughly mixed, and in a moistened

condition are placed in a wheel mill where they are reduced to an impalpable powder. This powder, while still in a moist condition, is subjected to great hydraulic pressure, under which it is reduced to a dense and hard cake, known as 'mill cake.' This cake is then passed through crushing rollers which break it into grains of various shapes and sizes, the grains of the different sizes being separated from one another by screening. The granular material is then placed in the glaze mill where it is polished and glazed, the glaze being imparted by the admixture of a small quantity of graphite.

Guncotton. (Scientific names, *Pyroxylin* and *Nitrocellulose*).—Braconnot, of Nancy, in 1832 found that starch and similar bodies were rendered highly combustible by treatment with nitric acid. Pelouze, six years later, conducted further experiments with nitric acid on cotton paper and other vegetable substances. Dumas, still later, produced among other substances. one which he termed a nitramide, prepared by treating paper or cardboard with concentrated nitric acid. These early discoveries resulted in nothing of practical value, due to the lack of sufficient knowledge of the nature of the substances produced, and the necessary means for giving them stability.

In 1846, however, Schönbein discovered a method of making true guncotton. He was the first to add concentrated sulphuric acid to the nitric acid bath for the purpose of more highly concentrating it and at the same time for absorbing the water set free by the reaction of nitration. Also, in 1846, Bottger, of Frankfort-on-the-Main, made the same discovery independently of Schönbein, the latter having kept his method a strict secret until he learned of the work done by Bottger. The two inventors then joined hands in the exploitation of their invention and in recommending its use as gunpowder and as a blasting agent.

It was found to burn, however, with too great rapidity for use as gunpowder. An attempt was made to slow its action by weaving it into skeins and by compressing it in various ways, but none of these experiments were very successful. A large number of terrific explosions of guncotton in storage soon showed that something must be wrong in its manufacture, and it was discovered that the means which had been employed for its purification were insufficient.

Cotton fiber consists of minute tubes, and these small tubes when nitrated retain sufficient nitric acid to afterwards set up decomposition of the material, even when washed with very great care. Sir Frederick Abel, in 1865, made the important discovery that by boiling and finely pulping guncotton fiber the nitric acid could be entirely removed therefrom. It was found, however, that although the nitric acid was completely removed by this process, the guncotton would not keep well in a dry state, and that dry fibrous gun-

cotton would slowly and surely decompose on long standing.

Sir Frederick Abel also made the further important discovery that by compressing the guncotton into dense cakes by hydraulic pressure these cakes could be detonated or exploded with a cake of the dry compressed guncotton. Wet compressed guncotton, owing to its very insensitive character, and the fact that it cannot be exploded by ignition, is perfectly safe to handle and transport, while, when properly detonated as above described, it forms a very powerful high explosive. Years of experiment have demonstrated that guncotton in a wet state will keep indefinitely without the least sign of decomposition.

Wet compressed guncotton has had extensive use in naval and military operations as a high explosive charge for submarine mines and torpedoes, and it has had some use also as a bursting charge for projectiles. But as a naval and military explosive guncotton has now very largely given way to picric acid and its compounds, owing to the high stability and insensitiveness of picric acid, the ease of its production, and its low cost, while it is a much more powerful high explosive than guncotton.

Broadly speaking, there are three grades of nitration of cellulose, by which are formed three corresponding compounds, namely:

Mononitrocellulose	$C_6H_8O_4(HNO_3)$
Dinitrocellulose	$C_6H_6O_3(HNO_3)_2$
Trinitrocellulose	$C_6H_4O_2(HNO_3)_3$

It has been found, however, that a great variety of forms of guncotton may be produced by varying the temperature of the acids bath, and by varying the proportions of the nitric acid and the degree of concentration of the acids, and by the character of the cellulose itself. It is probable that many hundreds of varieties of guncotton have been produced.

Guncotton of a very low form of nitration, due to its solubility in camphor, with which it forms an intimate compound known as celluloid, has given nitrocellulose an extensive use in that industry.

Trinitrocellulose, $C_6H_4O_2(HNO_3)_3$ is insoluble in a mixture of two parts ether and one part alcohol, while all of the lower forms of nitration are soluble in such mixture.

Owing to its high degree of nitration—that is to say, owing to the amount of nitric acid which it contains, this form of nitrocellulose is the most highly explosive, and is, therefore, the best adapted as a blasing agent; while for celluloid, where the explosive or combustive properties are desired to be reduced to the minimum, a very low form of nitration is preferable.

A nitrocellulose of an intermediate degree of nitration, sometimes referred to as pyronitrocellulose,

$C_{30}H_{38}(NO_2)_{12}O_{25}$ is that form in most general use in the manufacture of smokeless powders, and is the kind employed in the manufacture of the service smokeless powder of the United States Government. This nitrocellulose, being very readily soluble in a mixture of ether and alcohol, while it is, at the same time, of a fairly high degree of nitration, and for other reasons—given under the head of smokeless powder, is better adapted than other varieties of nitrocellulose for such use.

Process of Manufacture.—The most common method of nitration employed for the production of trinitrocellulose is the following: A mixture of 1 part concentrated nitric acid and 3 parts concentrated sulphuric acid are used for the bath. The nitric acid must have a specific gravity of at least 1.52, and the surphuric acid must have a specific gravity of 1.84 at 15° C. One pound of cellulose produces about 1.6 pounds of trinitrocellulose.

The dipping is done in cast iron tanks, a series of which is arranged in a row and cooled by a stream of cold water flowing around them. The tanks hold about 12 gallons each, and the cotton is dipped in portions of about one pound at a time. It is immersed in the acids and the workman moves it about for about three minutes with an iron hook. He then lifts it out and lays it upon an iron grating, to let the excess of acids drain off, and with a sort of lever he squeezes out a portion of the excess of acids. The material, then containing about ten times its weight of the mixed acids, is placed in an earthenware pot, surrounded by cold running water, where it is generally allowed to stand for about 48 hours. The temperature of the pots should not be allowed to rise beyond about 18° or 19°C. Generally speaking, the cooler the pots are kept, the better. The next operation is the removal of the excess of acids. This is done by placing the contents of three or four pots in a centrifugal machine, which revolves at a rate of 1000 to 1500 turns per minute, the acids being thrown out by centrifugal force. The nitrated cotton, when taken from the nitrating pots, is immersed quickly in a large tank of water and rapidly stirred. A stream of water is generally allowed to run through a drowning tank and series of washing tanks, which serves to remove from the nitrocellulose a very large percentage of remaining acids. The nitrocellulose is then placed in large tanks where it is boiled, with frequent changing of the water, until the water no longer turns litmus paper red.

In the manufacture of pyronitrocellulose for smokeless powder, some governments require the materials to be boiled for two weeks. This is not only to remove the nitric acid but to decompose and remove by hydration undesirable compounds of a lower nitration.

After being thoroughly boiled, the nitrocellulose is pulped and poached, and is then either compressed into

cakes, or used in a fibrous state, according to the purpose for which it is to be employed.

The latest method of nitrating cellulose, however, is that invented by Dr. Robert C. Schüpphaus, and now in pretty general use. It consists in nitrating the cellulose directly in the centrifugal machine, which is made of steel and is large enough to contain many times the quantity of acids and many times the quantity of cellulose to be nitrated that could be placed in the old style dipping pan. By allowing the cotton to steep in a larger quantity of acids, the action of nitration is rendered more rapid and complete.

The most notable varieties of pyroxylin used in the arts are as follows:

1. Trinitrocellulose, known as insoluble pyroxylin, which is soluble in neither nitroglycerin, wood-alcohol, nor a mixture of ether and alcohol, but is readily soluble in concentrated acetone and the acetates of methyl, ethyl, and amyl. Employed mainly as a high explosive.
2. Pyronitrocellulose, soluble in a mixture of ether and alcohol, and all the usual solvents, but insoluble in nitroglycerin. Used mainly in the manufacture of smokeless powder.
3. Collodion-pyroxylin, insoluble in nitroglycerin, but soluble in all the usual menstra. Used in the manufacture of collodion.
4. Varnish-pyroxylin, insoluble in nitroglycerin; very soluble in wood alcohol and other menstra, to which it imparts much more body than do any of the other varieties of nitrocellulose.
5. Gelatin-pyroxylin, soluble in nitroglycerin, with which it forms a tough, elastic jelly. Gelatin-pyroxylin is not suitable for collodion or varnish for the reason that it thickens the menstra without imparting sufficient body, and the solution does not flow or spread well.

High Explosives.—Explosive compounds which may be detonated by ignition or percussion, or by means of a suitable fulminate primer or cap, so that their explosion is practically instantaneous throughout their mass, are known as high explosives.

The most notable high explosive compounds are the dynamites of different varieties, guncotton, nitroglycerin, nitrogelatin, fulminate of mercury, picric acid, and picric acid compounds.

Nitroglycerin and the Dynamites.—*Nitroglycerin*, or blasting oil [$C_3H_5(O.NO_2)_3$], was discovered by A. Sobrero, in the laboratory of Pelouze in Paris in 1847. Although the terrific explosive force of this material was known from the first, no marked success attended its use as a blasting agent, owing to its sensitive character and the danger attending its manufacture on a large scale, with the knowledge and methods of the time.

Nitroglycerin was first made on a large scale by Alfred Nobel, a Swedish engineer, in 1863. Nobel introduced great improvements in its production and purification, and was also the first to employ a detonator for exploding it. Nobel further discovered that by absorbing the nitroglycerin in a very absorbent form of earth, known as infusorial earth, the sensitiveness of the nitro-

glycerin was very much reduced. This mixture he introduced in 1866 under the name of dynamite.

Several years later Nobel discovered that a form of nitrocellulose or guncotton could be made which would dissolve in warm nitroglycerin, forming a thick jelly, and that this jelly, which was afterwards named nitrogelatin, could be made very insensitive indeed, according to the percentage of nitrocellulose dissolved in it. Nobel patented this compound in England in 1875.

The use of infusorial earth, however, has now been pretty generally abandoned, and in its place an absorbent for the nitroglycerin is made of a mixture of wood meal, pulverized nitrate of soda, or nitrate of ammonia, with frequently the addition of a small percentage of sulphur, rosin, or charcoal. The nitroglycerin is frequently thickened with about 2 per cent. gelatin-pyroxylin before being mixed with the absorbent materials or dope. This is known as gelatin-dynamite. Both common dynamite and gelatin-dynamite are classed according to the percentage of nitroglycerin contained. The most common is 40 per cent. dynamite, and the other varieties are generally 50 per cent., 60 per cent., and 70 per cent. dynamite.

Process of Manufacture.—According to the latest method of manufacture on a large scale, nitroglycerin is made as follows: A charge of 7,500 pounds of mixed nitric and sulphuric acids is run into a steel tank, which tank is provided with a vertical rotating shaft armed with paddles for the rapid stirring of the acids when the glycerin is let in. The tank is also provided with coils through which cold water is circulated for maintaining a low temperature. In order to keep down the heat developed by the reaction, the temperature must be kept between 20° and 25° C (68° and 77° F). This is regulated by the amount of glycerin injected into the mixed acids and the efficiency of the cooling means.

The glycerin is allowed to run into the acids in a continuous stream, while the acids are agitated. The acid mixture consists of 1 part nitric acid to 1.7 parts sulphuric acid. Only the most highly concentrated acids are used. The quantity of glycerin should be 14½% of the total weight of the acids used. When the glycerin is all run in, the charge is drawn off into a separating tank where the nitroglycerin rises on top, while the acids are drawn off to be recovered, and the nitroglycerin is run into the drowning and washing tanks. One pound of sweet glycerin should yield 2.23 pounds of nitroglycerin.

Picric Acid and High Explosive Compounds of Picric Acid.—Picric Acid, or *Trinitrophenol* [$C_6H_3(NO_2)_3O$], is made by nitrating carbolic acid. It is a brilliant yellow crystalline compound, having a specific gravity of 1.7. It melts at 122° C, and may be cast in any shape desired.

Picric acid is quite insensitive to ordinary forms of

shock or percussion and has therefore been employed with more or less success as a bursting charge for projectiles. Still, many explosions have occurred with disastrous results from the shock of discharge of the gun. It is furthermore too sensitive for employment in shells for the penetration of armorplate of any considerable thickness.

Nevertheless, the British Government have made considerable use of picric acid melted and cast into projectiles, under the name of *Lyddite.*

The French Government gave the name *Melinite* to picric acid compressed or cast into projectiles, also to a mixture of picric acid and collodion, and other picric acid compounds with which that government has experimented.

Shimosite, the high explosive bursting charge used by the Japanese, is, like Lyddite, picric acid pure and simple, melted and cast into shells.

Maximite, the invention of Hudson Maxim (q.v.), was the first high explosive sufficiently insensitive to shock to be successfully employed as a bursting charge for armor-piercing projectiles, for the penetration of heavy armorplate.

Although the exact composition of Maximite is a secret of the United States Government—the same having been purchased of the inventor in 1900 after exhaustive tests—it is nevertheless known to be a picric acid compound, and while it possesses in an undiminished degree all of the force of pure picric acid, it is still so insensitive that it is capable of withstanding any shock upon armorplate which the projectile itself is capable of enduring without breaking up, thus enabling the penetration of the heaviest armorplate with the high explosive, to be exploded by a detonating fuse behind the armor and inside the war vessel.

Fulminate of Mercury [$C(NO_2)(CN)Hg$.].—No other substance is so well adapted as an exploder or detonator for exploding or detonating other high explosives as is fulminate of mercury. But the extreme sensitiveness of the compound renders great care necessary in its handling. Many attempts have been made to lessen its sensitiveness by agglutinating agents like shellac and other gums, in order to adapt it as an exploder for bursting charges of high-explosive projectiles, where, owing to the necessary insensitiveness of the high explosive, a very powerful detonator is required, which detonator must also be sufficiently insensitive to withstand the shock of acceleration in the gun.

In detonating fuses some inventors have subdivided the fulminate, besides adding shellac, but both the shellac and the partitions consume so much of the energy of the fulminate compound as to render such devices quite impracticable.

Hudson Maxim's Fulminate Compound.—Hudson Maxim invented a fulminate compound, which, while

it is very insensitive, is still more powerful than pure fulminate. By the Maxim method the fulminate is agglutinated and made into a dense and rubbery mass by a colloid consisting of gelatin-guncotton dissolved in nitroglycerin. Acetone is used to facilitate the operation, and is afterwards evaporated from the compound. From 100 to 300 grains of this fulminate compound are employed for exploding Maximite and other insensitive high explosives used as bursting charges for projectiles, and this successful compound, while consisting of 90 per cent. fulminate with only 10 per cent. of the agglutinating agent, is sufficiently insensitive not only to withstand the shock of discharge of the gun, but also to withstand the much greater shock of the projectiles in the penetration of armorplate.

Sprengel Explosives.—Sprengel Explosives is the name given to a large class of explosives introduced by Hermann Sprengel in 1873, in which potassium-chlorate is used in place of nitric acid as the oxygen carrier. The Sprengel safety mixtures are based on the idea of keeping the ingredients separate for safety in handling, transportation and storage, and mixing them only when required. They were used in America for blasting operations at the Hell Gate in New York Harbor, under the name of Rack-a-Rock, which consists of potassium-chlorate and nitro-benzene.

The principal varieties of this class of explosives are known by the following names: *Rack-a-Rock, Hellhoffite, Oxonite, Panclastite,* and *Romite.*

Smokeless Powder.—A smokeless gunpowder is one which, as the name implies, produces no smoke when burned; that is to say, its products of combustion are practically all gaseous.

The enormous advantages of smokelessness in a gunpowder had long been appreciated by naval and military men, and numerous attempts were made to solve the problem many years prior to the production of a successful smokeless powder.

Although many other nitro-compounds have been suggested and experimented with as ingredients of smokeless gunpowder, guncotton has from the first been the most promising ingredient, and practically all successful smokeless powders have been made either entirely of guncotton or with guncotton as a base.

Probably the most important step in the production of smokeless powder was taken by Abel in 1865. In his United States patent of 1866 Abel describes a method of making solid masses of a mixture, in a fibrous pulped state, of soluble and insoluble guncottons, by subjecting the material to a solvent of the soluble guncotton, thus making the solvent serve as a combining medium for the insoluble guncotton, either in conjunction with or without pressure. In this way grains were formed of sufficient density and hardness to adapt them for use in guns. The import of this in-

vention is better realized when we take into consideration the fact that the introduction and employment of modern smokeless powders has brought about a complete revolution in firearms and in projectiles.

Abel's invention was as great a step as could well have been made in smokeless powders in advance of radical improvements in firearms. Smokeless powder could be made to-day exactly according to his abovementioned invention which would give very good results indeed in the smaller calibre shoulder arms now in use; while none of the recent smokeless rifle powders could be made to give much better results in the old Martini-Henry rifle than were then attained by Abel with his powder, particularly if we except nitroglycerin compounds.

Probably the next most important invention in explosive compounds leading up to smokeless powders was made by Alfred Nobel, and patented by him in Great Britain in 1875. This invention was for the gelatinization of nitro-glycerin with pyroxylin, with or without other solvents or the application of heat. He states that the quantity of solvent should be varied with the degree of solubility of the guncotton; and as he mentions acetone as one of the solvents, which is a solvent of trinitrocellulose, and the employment of slowing agents or deterrents, among them fatty matters, to lessen the sensitiveness of the compound, to particularly adapt the explosive to military purposes; and as the chief essential difference between his nitro-gelatin and cordite and ballistite is one of proportions of the ingredients, we are forced to give him credit for having anticipated these compounds. As Nobel was thoroughly conversant with the work that had been done by Von Lenk, Abel and others, it is at least reasonable to presume that he thought of the employment of his nitro-gelatin compound as a propelling as well as a blasting agent; but there is no direct proof of this in the language of the patent.

Daniel Spill, also in 1875, patented a process for the production of tubes for military and other purposes from soluble guncotton, gelatinized with ether and alcohol, or nitro-benzine.

Colonel Schultz, an Austrian artillery officer, made a sort of semi-smokeless powder in 1860, for sporting purposes, it being a form of nitrated cellulose, impregnated with nitrate of potassium or nitrate of barium. A smokeless powder was also, about the same time, made by Dittmar on pretty much the same lines.

In 1866 Messrs. Prentice & Sons, of Stowmarket, made a sporting powder from a pulped mixture of guncotton and un-nitrated cotton. Later, they made a granular smokeless powder, consisting of pellets of compressed guncotton, water-proofed by india-rubber varnish.

About 1880 Messrs. Reid & Johnson produced at

Stowmarket a smokeless sporting powder of pulped soluble guncotton and nitrate of barium, the mixture being granulated by tumbling in a pan to form round pellets, which were afterwards treated with solvents to harden them. The E. C. powder (Explosive Company's powder), first made at Stowmarket, in England, was an important advance in smokeless powders, and much credit is due to its inventors, Messrs. Reid & Johnson.

The French were the first to make smokeless powders from compounds of picric acid and picrates with nitrocellulose and other substances.

In the latter part of the eighties, the French Government produced a powder for small arms, known as the Lebel smokeless powder. Its method of manufacture was kept a rigid government secret, but it is now known that this powder was first made by dissolving soluble pyroxylin, later trinitrocellulose, in sufficient solvent to cause the solution to flow, then drying in thin sheets and cutting into small rectangular grains or laminæ. The French powder thus made was exceedingly dense, hard, and hornlike, so much so that it did not ignite readily, except with a very strong primer, and it would not burn through a sufficient thickness to permit of a granulation coarse enough to enable the use of the charges requisite to give desired velocities.

In 1888 Hudson Maxim began experiments in England with a view to the production of a successful smokeless gunpowder. Returning to America in December of that year, he continued his experiments in the United States. He was the first to manufacture smokeless powder in the United States and the first to submit samples to the United States Government for trial.

Mr. Maxim soon found that the hard and hornlike substance made from either dissolving or gelatinating guncotton in a solvent, and drying, burned too slowly to permit of this material being used with satisfactory ballistic results in large guns, for when the web of the material was made sufficiently thin to burn through and be entirely consumed in the gun there was so much initial surface presented to the flame of ignition when a sufficient weight of charge was employed, as to produce prohibitive pressures. He discovered that by adding a considerable percentage of nitro-glycerin to the guncotton jelly or solution the guncotton colloid was so much softened, and was made to burn with so much greater rapidity as to overcome this difficulty.

Simultaneously Abel and Dewar were making the same experiments in England, which resulted in the production of British Cordite, consisting of 58 per cent. nitroglycerin, 4 parts mineral jelly, and the rest trinitrocellulose. This British Cordite has lately been modified and now contains only 30 per cent. nitroglycerin. This step was taken owing to the great erosive character of the products of combustion of cordite containing 58 per cent. nitroglycerin.

In 1889 the idea was conceived by Hudson Maxim of making multiperforated smokeless powder grains in order to render them progressive in their combustion, thereby minimizing the initial area to the flame and raising to the maximum the burning surface just before the complete consumption of the grain. The idea of making multiperforated powder grains was not at that time broadly new, as already stated, except in its connection with the manufacture of smokeless powder, and the improvement lay not so much in the idea of perforating the grains as in a practical method for their manufacture.

The French added nitrate of barium to the nitrocellulose colloid, to increase the rapidity of its combustion, which end Mr. Maxim attained by multiperforating the grains, and which is attained in Cordite and Ballistite by the addition of nitroglycerin; but the multiperforations possess the advantage of both increasing the rate of combustion of the grains and of causing the combustion to progress with acceleration.

In 1893 Mr. Maxim joined forces with another inventor, Dr. Robert C. Schüpphaus, and they jointly produced the first smokeless powder to be adopted by the United States Government. This material was manufactured by rolling and stuffing through dies, in a similar manner to the manufacture of celluloid. Dr. Schüpphaus discovered that by the admixture of a small percentage of collodoin-cotton, pyronitrocellulose or gelatin-pyroxylin to the insoluble trinitrocellulose, the material was rendered very much tougher and more elastic and would dry without warping and cracking, and furthermore that the material could be worked with a very much smaller quantity of solvent, and that the powder would not, therefore, shrink so much in drying.

The Maxim-Schüpphaus powder consisted of rods multiperforated longitudinally with seven holes, and these rods were cut into grains about three diameters long; the thickness of web between the perforations varying with the calibre of the gun—a greater thickness being required for the larger guns. The thickness of web or wall which separated the perforations from one another and from the outside of the grain was such as would be completely burned through before the projectile left the gun. As the perforations rapidly enlarged from the combustion within them, an acceleration of combustion was the result, which served to better maintain the pressure behind the projectile in its flight through the gun than any form of grain previously employed.

The Maxim-Schüpphaus smokeless powder consisted of 82 parts trinitrocellulose, 8 parts gelatin-nitrocellulose, ½ per cent of urea, and 9½ per cent. nitroglycerin. The multiperforated grain produced by Hudson Maxim is still (1907) used by the United States Government, although the composition of the powder has been altered. The present service powder of the United States

consists of pyronitrocellulose gelatinized with a mixture of ether and alcohol, which is then formed into the Maxim multiperforated grains.

An improved powder grain by which still higher ballistic results are attainable than by his previous invention of longitudinally multiperforated grain was patented in 1901 by Hudson Maxim. This grain consists of a long flat strip three or more times as thick as the web thickness required for the gun in which it is to be employed; in other words, it is three or more times as thick as would be consumed in the gun in which it is to be fired, were it not perforated. The strip is, however, run through a perforating machine which punches small holes in both of its broader faces, the holes on each face penetrating to just such depth as will leave only a web thickness of material between the bottoms of the holes in one face and the bottoms of the holes in the opposite face, and the thickness of the walls between the sides of the perforations being also one web thickness.

When this grain is fired in a gun the flame within the perforations burns them larger and deeper, and just at the instant that the side walls are burned through between the perforations the bottoms of the holes on the one side burn through to meet the bottoms of the holes on the other side, thus effecting the complete consumption of the grain, with the maximum acceleration of combustion, which serves to maintain the pressure of the powder gases behind the projectile in its flight through the gun better than any other form of powder grain yet invented. Consequently higher velocities are obtained with lower pressures and with less erosive effect upon the gun than by any other form of grain.

The most notable form of smokeless powder that has come into use abroad, besides Cordite, is perhaps, Ballistite, the invention of Alfred Nobel. Ballistite consists of about equal parts gelatin-pyroxylin and nitroglycerin. These are incorporated in a wet state and then passed repeatedly between warm rolls until the mixture is dried out and the material is gelatinated and rolled into a hard, dense, amorphous colloid, which is cut into little squares of a thickness adapted to guns of different calibres.

EXPONENT, n. *ĕks-pō′nĕnt* [L. *exponens*, putting or setting out—from *ex*, out of, and *pōnō*, I put or set]: a representative of a party, as setting forth their views; one who expounds the views of another. In arithmetic and algebra a number or letter placed above and at the right of a quantity to indicate the power to which the latter is to be raised, thus, 10^4, a^3, $(a + b)^2$ are abbreviations for $10 \times 10 \times 10 \times 10$, $a \times a \times a$, $(a + b) \times (a + b)$ respectively. The older writers used *aaa* for a^3, and this notation persisted occasionally in printed books

down to as late as the last century. Exponents were used in the 16th century, but it was Descartes who first employed them systematically. Originally they were positive integers. But their characteristic property $a^n \times a^m = a^{n+m}$ (the *index law*) suggests at once an extension to negative and fractional exponents, as was observed by Wallis and worked out by Leibniz and Newton. Thus under the index law $a^n \times a^{-m} = a^{n-m} = a^n \div a^m$; hence a^{-m} may be consistently used to represent $1 \div a^m$. In the same way $a^0 = 1$. Further, since $a^{\frac{1}{2}} . a^{\frac{1}{2}} = a$, we may properly use $a^{\frac{1}{2}}$ to signify the square root of a. Similarly $a^{\frac{2}{3}}$ signifies the cube root of a^2, etc. If the exponent x of a^x is an irrational number, it may be regarded as the limit of a rational fraction p/q; then a^x is the limiting value of $a^{p/q}$ as p/q approaches x. The definition can be extended to the case when a and x are complex numbers. EXPONENTIAL: pertaining to exponents, as the exponential theorem (index law above). The quantity a^x, where a is fixed and x varies, is called an exponential quantity. It has the property of increasing in geometric proportion when x increases in arithmetic proportion. If $a^x = b$, x is called the logarithm (q.v.) of b to the base a. Generally, any quantity representing a power whose exponent is variable is called exponential, as a^x, x^x, $(1 + x)^x$, . . . Exponential equations are those which involve exponentials, as $a^x = b$. In the calculus the exponential function a^x is distinguished by the fact that its derivative (rate of increase) is proportional to itself. If the base a is taken equal to the number $e = 2.71828+$, the derivative of e^x is exactly e^x itself. EXPONIBLE PROPOSITION, proposition that is obscure in the sense that it is not in one of the recognized logical forms.

EXPORT, v. *ĕks-pōrt'* [F. *exporter*—from L. *exportārĕ*, to carry out, to convey away—from *ex*, out of; *porto*, I carry: It. *csportare*]: to carry or send produce or goods out of a country, either by land or by water, in course of trade. EXPORT'ING, imp. EXPORT'ED, pp.: ADJ. carried out of a country in the regular course of traffic. EXPOR'TER, n. one who. EXPOR'TABLE, a. *-tă-bl*, that may be exported. EX'PORTA'TION, n. *pōr-tā'shŭn* [F.—L.]: the act of conveying goods from one country to another, as by a merchant or trader. EXPORT, n. *ĕks'pōrt*, an article or commodity carried out of one country to another in the regular course of traffic.

EXPORTS: see IMPORTS AND EXPORTS.

EXPOSE, v. *ĕks-pōz'* [OF. *exposer*, to expose, to lay out—from L. *ex*; OF. *poser*, to set, to place: L. *expositus*, put or set out—from *ex*, out of; *positŭs*, put or placed]: to set out to public view; to exhibit; to disclose; to lay open; to make bare; to put in danger; to offer for sale. EXPO'SING, imp. EXPOSED', pp. *pōzd'*: ADJ. laid bare; unsheltered; uncovered; made public; offered for sale. EXPO'SURE, n. *pōs'zhûr*, the state of

being laid open to danger or inconvenience; situation of a place in regard to the points of the compass, or to sun and air; the laying open the character or conduct of any one; the act of exposing anything. EXPOSURE OF INFANTS: see INFANTICIDE. EX'POSI'TION, n. *-zĭsh'ŭn* [F.—L.]: a setting forth to public view; a laying open; an exhibition; an explanation or interpretation. EXPOS'ITIVE, a. *-pŏz'ĭ-tĭv*, or EXPOS'ITORY, a. *tēr-ĭ*, explanatory; serving to explain. EXPOS'ITOR, n. *-ĭ-tēr*, one who explains, interprets, or expounds.

EXPOSÉ, n. *ĕks'pō-zā* [F. *exposé*]: an exposing of something previously concealed; a formal recital of facts; reasons for explanation.

EXPOSITIONS. The Paris Exposition of 1900 was open from April 15 to Nov. 11, and during its existence 50,000,000 people visited the grounds. The grand entrance to the exposition grounds was off the Place de la Concorde. The grounds of the exposition extended along two narrow strips of the banks of the Seine, and the total area was 336 acres. Access was had to the various parts of the grounds by means of an electric railway and a moving sidewalk. The systematic grouping of the objects exhibited was arranged along educational lines in 18 groups.

The Pan-American Exposition, held in Buffalo, N. Y., from 1901, May 1, to Nov. 2 following, was to illustrate the progress of civilization in the western hemisphere during the 19th century, and to promote trade between the American countries. The site occupied about 350 acres. In 1897 it was planned that the exposition should be held on Cayuga Island, near Niagara Falls, in 1899, and work was begun. The war with Spain intervened and the enterprise was postponed. When it was revised it was on broader lines, the original site on Cayuga Island being abandoned, the grounds chosen in the n. part of Buffalo, within three miles of the business centre of the city. The principal buildings were arranged around a broad court. The Electric Tower, 375 ft. high, was the central attraction of the exposition, its main body being 80 ft. square and 200 ft. high. A spiral stairway in the centre led up to a domed cupola, on which was poised a figure of the Goddess of Light, overlooking and dominating the entire exposition. The exhibits of the exposition were divided into fifteen classes, as follows: electricity and electrical appliances; fine arts—painting, sculpture, and allied works; graphic arts—typography, lithography, steel and copper plate printing, photo-mechanical processes, drawing, engraving, and book binding; liberal arts—education, music, engineering, public works, constructive architecture, hygiene and sanitation; ethnology, archæology, progress of labor and invention, Six Nations' Indian exhibit, isolated and collective exhibits; agriculture, agricultural products; machinery and appliances; foods

and their accessories; horticulture, viticulture, floriculture; live stock; forestry and forest products, fish, fisheries and fish products, and apparatus for fishing; mines and metallurgy; machinery; manufactures; transportation exhibits, railways, vessels, vehicles, ordinance; exhibits from the Hawaiian Islands, Porto Rico, and the Philippines. The total attendance of the exposition was 8,120,048, and the total receipts for admissions were $2,467,066.88. See BUFFALO.

The South Carolina Interstate and West Indian Exposition was held in Charleston. It was opened 1901, Dec. 1, and presented an exhaustive exhibit of the material resources and industrial achievements of the Southern States. The exposition grounds covered 185 acres, and had 2,000 frontage on the Ashley river. The chief feature of the exposition was the Southern Garden, with surrounding court of palaces, built in the shape of a horseshoe. The court of palaces consisted in the Cotton Palace, Palace of Commerce, and Palace of Agriculture, the three buildings occupying an aggregate of 136,000 sq. ft. of floor space.

In 1903 the following expositions were authorized: An International Food Exposition at London, Eng. 1903; Agricultural and Industrial Exposition at Sivas, Turkey, 1903; Industrial Exposition at Osaka, Japan, 1903; British and Colonial Exposition at Cape Town, 1903; the Louisiana Purchase Exposition at St. Louis, Mo., 1904 (see ST. LOUIS); and an International Peace Exposition at Johannesburg, 1904–5 (see also EXHIBITION). In 1905, the Lewis and Clark Exposition was opened at Portland, Oregon. It was in commemoration of the centennial year marking the exploration of the Oregon country by an expedition under Captains Lewis and Clark. Their journey was planned by Thomas Jefferson during his presidency. It was open from June to October, 1905. There were 8 large buildings. The total area was 406 acres. Over 2,500,000 visitors passed through the gates, nearly 20 per cent. being from the east and the Mississippi valley. In 1907, the Jamestown Exposition, to celebrate the Ter-Centennial of the Settlement of Jamestown, Va., was held at that city. It was strongly supported by the United States government, the total of appropriations voted by congress reaching nearly $1,000,000.

EX POST FACTO, *ĕks′ pōst făk′tō* [L. *ex,* out of; *post-factus,* done afterward]: after the deed is done; applied to a law enacted to meet a particular crime after the deed has been committed. The Constitution of the United States prohibits the passing of such laws: the prohibition applies only to criminal and penal statutes.

EXPOSTULATE, v. *ĕks-pŏs′tū-lāt* [*L. expŏstŭlātus,* demanded urgently, found fault—from *ex,* out of; *pŏstŭlātus,* required or demanded]: to reason earnestly with, as on some impropriety of conduct; to remonstrate in a

friendly manner. EXPOS'TULATING, imp. EXPOS'TULATED, pp. EXPOS'TULATOR, n. *-tėr*, one who. EXPOS'TULA'TION, n. *lā'shŭn*, the act of reasoning with a person with reference to his conduct. EXPOS'TULA'TORY, a. *-lā'tėr-ĭ*, containing expostulation.

EXPOUND, v. *ĕks-pownd'* [OF. *espondre*, to explain—from L. *expōnĕrĕ*, to put or set up—from *ex*, out of; *pōnō*, I set or place]: to make clear; to explain; to lay open; to interpret. EXPOUND'ING, imp. EXPOUND'ED, pp. EXPOUND'ER, n. one who.

EXPRESS, a. *ĕks-prĕs'* [F. *exprès*, plain, clear, on purpose—from L. *expressus*, squeezed out, represented—from *ex* out of; *pressus*, pressed or sunk down]: plain; clear; given in direct terms; sent on a particular errand; intended for a particular purpose; copied, or resembling—applied to painting, sculpture, etc.; employed as a direct and speedy conveyance; used *adverbially*, on purpose; for a particular end: N. any direct and fast conveyance; a messenger or vehicle sent for a particular purpose; a special message: V. to press or squeeze out; to declare in words; to utter; to represent; to denote. EXPRES'SING, imp. EXPRESSED', pp. *prĕst:* ADJ. squeezed out, as juice; uttered; set down in writing. EXPRESS'LY, ad. *-lĭ*, in direct terms; plainly. EXPRES'SION, n. *-prĕsh'ŭn* [F.—L.]: manner of utterance; mode of speech; declaration; a natural and lively representation of an object in painting or sculpture; the transient change which takes place in the permanent form of a face or figure while under the influence of various emotions; the modulation of the voice suited to the subject of music; the appearance of the countenance; the representation of an algebraic quantity by its proper symbols. EXPRES'SIONLESS, a. wanting in expression. EXPRES'SIBLE, a. *-prĕs'sĭ-bl*, that may be squeezed out; that may be uttered. EXPRES'SIBLY, ad. *-blĭ*. EXPRES'SIVE, a. *-sĭv*, serving to utter or represent; representing emphatically or clearly; significant. EXPRES'SIVELY, ad. *-lĭ*. EXPRES'SIVENESS, n. the quality of being expressive. EXPRESS'NESS, n. the quality of being express. EXPRESSURE, n. *ĕks-prĕsh'ûr*, in *OE.*, expression; utterance; form or likeness; impression.—SYN. of 'express, v.': to declare; testify; intimate; signify; squeeze out; extort; elicit; indicate; exhibit; designate;—of 'expression': term; word; phrase; sentence; proposition; period; paragraph; indication; form; mode.

EXPRESS, *ĕks-prĕs':* organization for quick transmission of goods, merchandise, and parcels of all kinds. The express business in the United States had its rise in the custom of intrusting to stage-coach drivers, conductors of railroad trains, clerks of steamboats, commercial travellers, etc., parcels for delivery at their respective destinations. This was done without any system or organization, till William F. Harnden, of Boston, a railroad employé, conceived the idea of arranging for

a regular package-delivery service between Boston and other cities and towns in Mass. He contracted with the Boston and Worcester r.r. co., 1838, for the transmission of packages over its line. In 1839, March, appeared, in the Boston newspapers, Harnden's announcement of a collection and delivery service between Boston and New York; and on March 4 he made his first trip, *via* the Boston and Providence r.r. and steamboat on Long Island Sound. His packages were carried in his hand-bag, and consisted of books from Boston publishers, orders from them to publishers in New York, and some notes of western, southern, and New York state banks, forwarded by brokers for exchange with issues of New England banks: a stout trunk soon took the place of the hand-bag. Besides carrying parcels, Harnden undertook to have an oversight of common freight, and to secure its prompt delivery in New York. His express service was extended to Philadelphia 1840, to Albany, N. Y., 1841. His partner, Dexter Brigham, went to England 1840, and established agencies in the principal European cities for express service proper, as well as for the sale of passage-tickets to emigrants, and the purchase and sale of foreign exchange. Harnden disposed of his Boston, Springfield, and Albany line abt. 1843 to Thompson & Co., who gave it their name. Harnden died 1845. A monument was erected to his memory, 1866, in the Mt. Auburn Cemetery, Cambridge, Mass., by 'the express companies of the United States.'

A rival line between Boston and New York was begun by Alvin Adams 1840: its collections and deliveries were for a year or two restricted to those 2 cities and the intermediate towns—New London, Norwich, and Worcester. Adams associated with himself, as partner, William B. Dinsmore, 1841, who took charge of the New York office: Adams & Co. opened their first office in Philadelphia 1843, and the same year Adams's partner and agent at Philadelphia associated himself with Samuel M. Shoemaker, to establish a line to Washington. At the outbreak of the civil war, Adams & Co.'s lines extended throughout a large part of New England, the whole south, and the northern states along the boundary between north and south. Henry Wells, an employé of Harnden, in association with Crawford Livingston, established a weekly line between Albany and Buffalo 1841: it became a daily line 1843, and the same year offices were opened at points on the Hudson river, between Albany and New York. Wells & Co. (one of the partners being William G. Fargo) opened a line to Chicago 1845; the same year they carried letters between New York and Buffalo for 6 cents, the post-office charging 12: Wells & Co. also established a European Express 1846, with offices in London and Paris. In 1852 the firm of Wells, Fargo & Co. was founded for conducting the express business in the far west and the Pacific states and territories: it pur-

chased the rights, good-will, etc., of the Erie Express Co., 1888.

The corporation known as the Adams Express Co. was formed 1854 by the union of Adams & Co., Harnden & Co., Thompson & Co., Kinsley & Co., and Hoey & Co.: in 1887 the Adams Express Co. had 7,800 employés, 1,826 wagons, 2,235 horses, and operated on 23,000 m. of railroad. The American Express Co. is a consolidation, effected 1850, of Livingston & Fargo, Wells & Co., and Butterfield, Warner & Co. The Eastern Express Co. is a consolidation of several individual lines in the New England states. The National Express Co. had for its nucleus Pallen, Virgil & Stone's express, founded 1848, as a line between New York and Montreal. The nucleus of the United States Express Co. was the express business of the New York and Erie r.r.: it has absorbed the Delaware and Lackawanna Express Co., the Western Express Co., and the Baltimore and Ohio Express Co. The most modern American express service, when conducted on a large scale, usually includes, in addition to conveyance of ordinary merchandise packages, the following special features:

Travelers' cheques, letters of credit, sight drafts, money orders, money transfer by cable and telegraph, payment of taxes, dues, etc., for nonresidents, conveyance of valuables and securities, collection of accounts, collection of notes, drafts, and C. O. D. parcels, purchase of goods, household supplies, books, articles, or commodities, rare or otherwise, and the performance of every other legitimate commercial, financial, or other transaction requiring the service of a personal representative of intelligence and discretion.

The 'cheque' system has been so perfected that travelers in foreign countries save time and avoid delay by their use, as they are promptly recognized and cheerfully cashed or accepted by the principal hotels, steamship and sleeping-car companies, by many railroad companies, and by merchants, shopkeepers, and others, in settlement of accounts.

For those traveling in the United States, Canada, Mexico, Central and South America, these cheques afford the advantages of a secure and convenient means of carrying funds immediately available, combined with the avoidance of delays, of the risk of loss of money by fire or destruction, and of the annoyance of negotiating personal checks in places where such may be unacceptable.

'Letters of Credit' now form a usual express office specialty. These documents are drawn in sterling and are available in all parts of the world. Through the Letters of Credit system, cheques may be obtained from express agencies at all important points. Every foreign express correspondent has a cable address, also every express agency.

The 'C. O. D.' system and bank of account collection are among the useful developments of express service. 'C. O. D.' shipments are subject to collection of bill or invoice for the goods, with prompt return of proceeds made at a small charge for such service. C. O. D. shipments to foreign countries are usually made under the same system as applied to domestic points.

Several of the big express companies attend to the collection of accounts, bills, notes, drafts, etc., in any part of the commercial world. Collections in United States and Canada are effected with unusual promptness and at less risk and cost to payee than by other methods. Collections in foreign countries of drafts or deposits, or by powers of attorney, are undertaken by express companies through their own organizations in Europe or through banking correspondents. The proceeds of C. O. D.'s or collections are transferred by cable when patrons desire, with a charge for collecting, plus only the cost of cablegrams.

The transfer of money is another useful and much appreciated feature of express service. Purchases are made and commissions executed for patrons, in the quickest possible time, throughout the world.

EXPRESSIONE, *ĕks-prĕs-sē-ō′nē*, Con, or Espressivo, *ĕs-prĕs-sē′vō:* Italian term in music, meaning with expression; impassioned, with pathos. Where the word appears at the beginning of a composition, the piece must be executed throughout with feeling. 'Expressione' frequently appears above certain passages which alone are to be performed so, while the harmony in the accompaniment goes on quietly.

EXPRESSIVO, adv. *ĕks-prĕs-sē′vō*, or Espressivo, adv. *ĕs-prĕ-sē′vō* [It. *espressivo*]: in *mus.*, with expression.

EX PROFESSO, phrase, *ĕks pro-fĕs′ō* [L.]: by profession; professedly.

EXPROPRIATE, v. *ĕks-prō′prĭ-āt* [mid. L. *exproprĭātus*—from L. *ex*, out of; *proprĭŭs*, one's own]: to hold no longer as one's property: to make no longer one's own. Ex′propria′tion, n. *-ā′shŭn* [F. *expropriation*, a taking possession of a debtor's landed property]: the act of holding no longer as one's own.

EXPULSION, n. *ĕks-pŭl′shŭn* [F. *expulsion—from* L. *expulsĭōnem*, a driving out—from *ex*, out of; *pulsus*, driven: It. *espulsione*]: the act of expelling by authority, force, or violence; ejectment. Expul′sive, a. *-sĭv*, having the power of driving out. Expulse, v. *ĕks-pŭls′*, in *OE.*, to drive out; to expel.

EXPUNGE, v. *ĕks-pŭnj′* [L. *expungĕrĕ*, to blot out—from *ex*, out of; *pungo*, I prick or puncture: It. *espungere*]: to blot or wipe out; to efface; to obliterate. Expung′ing, imp.: Adj. blotting out; erasing. Ex-

PUNGED′, pp. *-pŭnjd′*.—SYN. of 'expunge': to erase; cancel; strike out; destroy.

EXPURGATE, v. *ĕks-pĕr′gāt* [L. *expŭrgātus*, purged quite, purified—from *ex*, out of; *pŭrgātus*, cleansed: It. *espurgare*]: to cleanse; to purify; to purge. EXPUR′GATING, imp. EXPUR′GATED, pp.: ADJ. cleansed; purified. EXPUR′GATOR, n. *-gā-tĕr*, one who expurgates or purifies. EX′PURGA′TION, n. *-gā′shŭn*, the act of cleansing or purifying. EXPUR′GATO′RIAL, a. *-tō′rĭ-ăl*, cleansing or freeing from blame. EXPUR′GATORY, a. *-gă-tēr-ĭ*, serving to purify or cleanse. INDEX EXPURGATORIUS, *ĭn′dĕks ĕks-pĕr gă-tō′rĭ-ŭs*, a list of works condemned by the R. Cath. Ch. as either heretical or dangerous to the Roman Catholic faith.

EXQUISITE, a. *ĕks′kwĭ-zĭt* [L. *exquisītus*, carefully sought out, excellent—from *ex*, out of; *quæsītus*, sought or searched for: F. *exquis*, exquisite, excellent—*lit.*, carefully sought out]: perfect; complete; highly finished; capable of nice or delicate perception; very sensibly felt; nice; delicate; exact; extreme, as pain or pleasure: N. one nice or refined in dress; a fop; a dandy. EX′QUISITELY, ad. *-lĭ*. EX′QUISITENESS, n. state of being exquisite; nicety; keenness.—SYN. of 'exquisite, a.': refined; consummate; matchless; accurate; exceeding; extreme; keen; fastidious.

EXSANGUIOUS, a *ĕk-săng′gwĭ-ŭs*, or EXSAN′GUINOUS, a. *-gwĭ-nŭs* [L. *exsanguis*, bloodless—from *ex*, out of; *sanguis*, blood]: without blood. EX′SANGUIN′ITY, n. *-gwĭn′ĭ-tĭ*, state of being without blood.

EXSCIND, v. *ĕk-sĭnd′* [L. *ex*, from; *scindo*, I cut or tear]: to cut off from fellowship; to remove or separate entirely. EXSCIND′ING, imp. EXSCIND′ED, pp.

EXSERTED, a. *ĕk-sĕr′tĕd* [L. *exsertus*, thrust forth]: in *bot.*, projecting beyond something else, as stamens beyond the corolla.

EXSICCATE, v. *ĕk′sĭk′kāt* [L. *exsiccātus*, made quite dry—from *ex*, out of; *siccus*, dried up]: to deprive of moisture. EXSIC′CATING, imp. EXSIC′CATED, pp. dried up. EXSIC′CANT, a. *-kănt*, having power to dry up. EX′SICCA′TION, n. *-kā′shŭn*, the drying up of solid bodies; the expulsion of moisture from solid bodies by heat, pressure, or any other means. EXSICCATOR, n. *ĕks′sĭk-kā-tĕr*, apparatus for drying. In most cases such substances are used as chloride of calcium, which readily absorbs moisture.

EXSTIPULATE, a. *ĕks-stĭp′ū-lāt′* [L. *ex*, without, *stipŭlă*, a stalk or stem]: in *bot.*, destitute of stipules.

EXSUFFLICATE, a. *ĕks-sŭf′lĭ-kāt* [mid L. *exsufflārĕ*, to blow at, to despise]: in *OE.*, blown or puffed out; empty; contemptible.

EXTANT, a. *ĕks-tănt′* [L. *exstantem*, projecting—from *ex*, out of; *stans*, standing]: in existence; not destroyed or lost.

EXTEMPORANEOUS, a. *ĕks-tĕm′pō-rā′nĭ-ŭs* [Sp. *extemporaneo*, extemporaneous—from L. *ex*, out of; *tempus*, time, *tempŏră*, times]: done or uttered without preparation; unpremeditated; not having the aid of manuscript. EXTEM′PORA′NEOUSLY, ad. *-lĭ*. EXTEM′PORA′NEOUSNESS, n. EXTEM′PORARY, a. *-rĕr-ĭ*, unpremeditated; without preparation; sudden. EXTEM′PORAR′ILY, ad. *-lĭ*. EXTEMPORE, ad. *ĕks-tĕm′pō-rĕ* [L. *ex*, *tempŏrĕ*]: on the spur of the moment, without preparation; without the aid of manuscript. EXTEM′PORIZE, v. *-rīz*, to speak without preparation; to improvise. EXTEM′PORIZING, imp. EXTEM′PORIZED, pp. *-rīzd*. EXTEM′PORIZER, n. *-rĭ-zĕr*, one who.

EXTEND, v. *ĕks-tĕnd′* [L. *extendĕrĕ*, to spread out; *extensus*, spread out—from *ex*, out of; *tendo*, I pull or stretch: It. *estendere:* F. *étendre*]: to stretch in any direction, to any distance; to enlarge or increase; to diffuse; to reach: to impart. EXTEND′ING, imp. EXTEND′ED, pp.: ADJ. spread; expanded. EXTEND′EDLY, ad. *-lĭ*. EXTEND′ER, n. he or that which extends. EXTEN′DIBLE, a. *-tĕn′dĭ-bl*, capable of being stretched or enlarged: in *law*, that may be seized under a writ of extent and valued. EXTENDIBILITY, n. *-bĭl′ĭ-tĭ*, capability of being extended, stretched, enlarged, or expanded. EXTENSIBLE, a. *ĕks-tĕn′sĭ-bl* [L. *extensus*, stretched out]: that may be extended. EXTEN′SIBIL′ITY, n. *-bĭl′-ĭ-tĭ*, capacity of being extended. EXTEN′SILE, a. *-sĭl*, capable of being extended. EXTEN′SION, n. *-tĕn′shŭn* [F.—L.] the act of enlarging or stretching out; enlargement; an essential property of bodies, because they must occupy a part of space, however small; in *logic*, the number of objects which a term includes. EXTEN′SIVE, a. *-sĭv*, large; wide; EXTEN′SIVELY, ad. *-lĭ*. EXTENSIVENESS, n. state of being extensive; largeness; wideness. EXTEN′SOR, n. *-sĕr*, in *anat.*, a muscle which serves to extend or straighten a joint: EXTENT, n. *ĕks-tĕnt′* [L. *extentus*, stretched out]: the space or degree to which a thing is extended; compass; size; in *O.E.*, extended. EXTENT, in *English law*, writ issuing out of the court of exchequer to compel payment of debts to the crown. In order to warrant the issue of this writ, the debt must be a debt of record (q.v.). As to *extent* in Scotland, there were no taxes in feudal times. The king was supported by the rents of his property lands, and by the occasional profits of superiority—ward, non entry, marriage, escheat, and the like—known by the general name of casualties (q.v.). Beyond these, and the expenses which the discharge of his ordinary duties to his superior imposed on him, the vassal was not liable to be taxed. But to this rule there were some exceptions. When it became necessary to redeem the king from captivity, to provide a portion for his eldest daughter, or to defray the expense of making his eldest son a knight, a general con-

tribution was levied. One of these occasions occurred when Alexander III. betrothed his daughter Margaret to Eric, the young king of Norway, and engaged to give her a tocher of 14,000 merks. This sum was far beyond the personal resources of the king, and consequently fell to be levied by a land-tax—land and its fruits being then the only appreciable species of property. But if the tax was to be levied fairly and equally, this could be only by ascertaining the value of the whole lands in the kingdom, as had been done in England in the time of Edward I. (4 Edw. I. i. anno 1276). Whether this was the first general valuation of all the lands of Scotland is not known; but it is certain that the valuation here spoken of was long known as *the old extent*. As such, it is spoken of in the act or indenture of 1326, July 15, by which the parliament of Scotland agreed to give to King Robert Bruce the tenth penny of all the rents of the laity during his life. See VALUATIONS OF LAND.—SYN. of 'extend:' to increase; expand; widen; dilate; distend; stretch.

EXTENDANT, a.: in *her.*, the same as Displayed; having the wings expanded.

EXTEN'SION, in Logic: number of the objects which a term includes; contrasted with COMPREHENSION: the two mutually explain each other. A general notion is said to be extensive according to the extent of its application, or the number of objects included under it. Thus Figure is a term of very great extension, because it contains in its compass many varieties, such as round, square, oblong, polygonal, etc. In like manner European is more extensive than German, man than European, animal than man, organized being than animal. The highest genera are formed by taking in a wider range of objects. Matter and Mind are the most extensive classes that we can form. For, though a higher genus is sometimes spoken of, viz: Existence, it is maintained that to call this a class is to generalize beyond real knowledge, which does not begin till we have at least two actual things to contrast with each other. It is said that that which can be contrasted only with non-existence, nonentity, or nothingness, gives no genuine knowledge: no property can be affirmed of it apart from the thing itself; this is by some deemed open to question. Matter, in its contrast to mind, is a real cognition; and *vice versâ*, mind in its contrast to matter. These, then, on the above principle, are the most extensive terms that have any real knowledge attached to them. But this property of extension is gained by dropping more and more of the peculiarities of the included individuals; 'organized being,' in order to include both plants and animals, must drop from its signification what is peculiar to each, and mean only what is common to both. In short,

these very extensive notions have a very *narrow* signification; it is the less extensive that have most meaning. The meaning of 'Man,' or the number of attributes implied in this generic expression, is large. Everything that goes to a human being—the human form and organization, the mental attributes of reason, speech, etc.—is expressed by this term, which is on that account said to be more COMPREHENSIVE than animal or organized being. Thus it may be seen that the greater the extension, the less is the comprehension; and the greater the comprehension, the less is the extension. An individual-name is the term of greatest comprehension, and of least extension. 'Socrates' comprehends all that is common to men and to philosophers, together with all that is peculiar to himself. On the logical uses of this distinction, see Sir W. Hamilton's *Lectures on Logic*, i. 140.

EXTENUATE, v. *ĕks-tĕn'ū-āt* [L. *extĕnŭātus*, made very thin—from *ex*, out of; *tenŭātus*, made thin: It. *estenuare:* F. *exténuer*]: to lessen; to diminish; to palliate, as a fault or crime; to mitigate. EXTEN'UATING, imp.; ADJ. lessening; diminishing. EXTEN'UATED, pp. EXTEN'UA'TINGLY, ad. *-lĭ*. EXTEN'UATOR, n. *-tėr*, one who. EXTEN'UA'TION, *-ā'shŭn* [F.—L.]: the act of representing any fault or crime less than it is; palliation. EXTEN'UA'TORY, a. *-tėr-ĭ*, that extenuates or palliates.—SYN. of 'extenuate': to palliate; hide; cover; conceal.

EXTERIOR, a. *ĕks-tē'rĭ-ėr* [OF. *exterieur*, the exterior—from L. *exterĭōrem*, outer—from *extĕrŭs*, on the outside, strange]: outward; external; relating to the outside or outer surface: N. the outward surface; that which is external. EXTE'RIOR'ITY, n. *-ŏr'ĭ-tĭ*, the quality of being exterior; outwardness; surface. EXTE'RIORLY, ad. *-ėr-lĭ*, externally. EXTE'RIORS, n. plu. *-ėrz*, outward parts of a thing; external deportment or forms. EXTERIOR SLOPE, in *mil.*, the surface of the parapet which faces the ditch.—SYN. of 'exterior, a.': external; outward; extraneous; extrinsic; foreign; outside.

EXTERMINATE, v. *ĕks-tėr'mĭ-nāt* [L. *extermĭnātus*, driven out or away—from *ex*, out of; *termĭnus*, a limit: F. *exterminer*, to put an end to]: to destroy utterly; to root out; to eradicate. EXTER'MINATING, imp.: ADJ. destroying utterly; eradicating. EXTER'MINATED, pp.: ADJ. utterly destroyed; eradicated. EXTER'MINA'TOR, n. *-tėr*, he or that which exterminates. EXTER'MINA'TION, n. *-nā'shŭn* [F.—L.]: total destruction; eradication. EXTER'MINA'TIVE, n. *-nā'tĭv*, that exterminates or utterly destroys. EXTER'MINA'TORY, a. *-tēr-ĭ*, tending or serving to destroy totally. EXTER'MINE, v. *-mĭn*, in *OE.*, to exterminate; to destroy utterly. EXTER'MINING, imp. EXTER'MINED, pp. *-mĭnd*.

EXTERNAL, a. *ĕks-tėr-năl* [L. *extĕrnus*, outward: It. *esterno:* F. *externe*]: outward; not within; visible;

foreign. EXTER'NALS, n. plu. *-năl̆z,* the outward parts; outward forms or rites. EXTER'NALLY, ad. *-lĭ.* EX'TERNAL'ITY, n. *năl'ĭ-tĭ,* state of being external. EXTERN, a. *ĕks-tėrn',* in *OE.,* outward; visible; coming from without: N. a student or pupil who does not reside within a college or seminary; a day scholar in Rom. Cath. schools.

EXTERRANEOUS, a. *ĕx-tĕr-rā'nē-ŭs* [L. *exterraneus; ex,* out, away; *terra,* earth or land]: belonging to or coming from abroad; foreign.

EXTERRITORIAL, a. *ĕks-tĕr-rĭ-tō'rĭ-al* [prefix *ex;* Eng. *territorial*]: beyond the jurisdiction of the laws of the country in which one resides.

EXTERRITORIALITY, n. *ĕks-tĕr'rĭ-tŏ-rĭ-ăl'ĭ-tĭ* [L. *ex,* out of, and Eng. *territory*]: in *diplomacy,* the right possessed by the respresentatives of foreign powers to live in the country to which they are accredited under the laws of the country to which they belong.

EXTINCT, a. *ĕks-tĭngkt'* [L. *exstinctus,* put out, quenched (see EXTINGUISH)]: quenched; put out; being at an end; no longer existing. EXTINC'TION, n. *-tĭngk'shŭn* [F.—L.]: the act of putting out; the state of being quenched or suppressed. EXTINC'TED, a. *-tĭngk'tĕd,* in *OE.,* extinguished.

EXTINE, n. *ĕks'tĭn* [L. *exter,* on the outside] in *bot.,* the outer covering of the pollen-grain; primine.

EXTINGUISH, v. *ĕks-tĭng'gwĭsh* [L. *extinguĕrĕ,* to put out, to quench—from *ex,* out of; *stinguo,* I put out, I quench: F. *éteindre;* OF. *esteindre,* to put out fire: comp. Gael. *teine,* fire]: to put out; to destroy; to suppress; to put an end to. EXTIN'GUISHING, imp. EXTIN'GUISHED, pp. *-gwĭsht,* put out; quenched; suppressed. EXTIN'GUISHER, n. he or that which extinguishes; that which puts out a candle. EXTIN'GUISHABLE, a. *-ă-bl,* that may be quenched or suppressed. EXTIN'GUISHMENT, n. *-mĕnt,* the act of suppressing, destroying, putting an end to, or abolishing; extinction, destruction, abolition; the state or condition of being utterly destroyed, exterminated or suppressed; extinction; destruction; in *law,* the extinction or ending of an estate, right, etc., by means of merging or consolidating it with another, usually one more extensive.

EXTIRPATE, v. *ĕks-tėr'pāt* [L. *exstirpātus,* plucked up by the stem or root—from *ex,* out of; *stirps,* a root: It. *estirpare:* F. *extirper*]: to root out; to destroy wholly; to remove completely; to exterminate. EXTIR'PATING, imp. EXTIR'PATED, pp.: ADJ. rooted out; totally destroyed. EXTIR'PATOR, n. *-tėr,* one who, or the thing which. EXTIR'PABLE, a. *-pă-bl,* that may be rooted out. EX'TIRPA'TION, n. *-pā'shŭn* [F.—L.]: total destruction; the act of rooting out. EXTIR'PATORY, a. *-pă-tėr-ĭ,* that roots out or destroys. EXTIRP, v. *ĕks-tėrp',* in *OE.,* to root out; to eradicate. EXTIRP'ING,

imp. EXTIRPED′, pp. *-tẽrpt′*.—SYN. of 'extirpate': to eradicate; destroy; root out; pull up; pluck up; expel.

EXTOL, v. *ĕks-tŏl′* [L. *extollĕrĕ*, to raise or elevate—from *ex*, out of; *tollo*, I raise: It. *estollere*]: to praise highly; to laud; to celebrate in words. EXTOL′LING, imp. EXTOLLED′, pp. *-tŏld′*. EXTOL′LER, n. one who.—SYN. of 'extol': to praise; applaud; magnify; commend; laud; glorify; approve.

EXTORT, v. *ĕks-tŏrt′* [L. *extortus*, twisted or wrenched out—from *ex*, out of; *tortus*, turned about, twisted: F. *extorquer*]: to wrest or wring from; to draw from by force; to gain from by violence, threats, or injustice: ADJ. in *OE.*, extorted. EXTORT′ING, imp. EXTORT′ED, pp. drawn from by expulsion. EXTOR′SIVE, a. *-tŏr′sĭv*, tending to draw from by compulsion. EXTORT′ER, n. one who. EXTOR′TIONER, n. *-tŏr′shŭn-ẽr*, one who practices extortion. EXTOR′TION, n. *-shŭn* [OF. *extortion*—L.]: the act or practice of wresting from; oppressive exaction; rapacity—usually said of money. EXTOR′TIONARY, a. *-ẽr-ĭ*, practicing extortion. EXTOR′TIONATE, a. oppressive. EXTOR′TIONIST, n. one who.

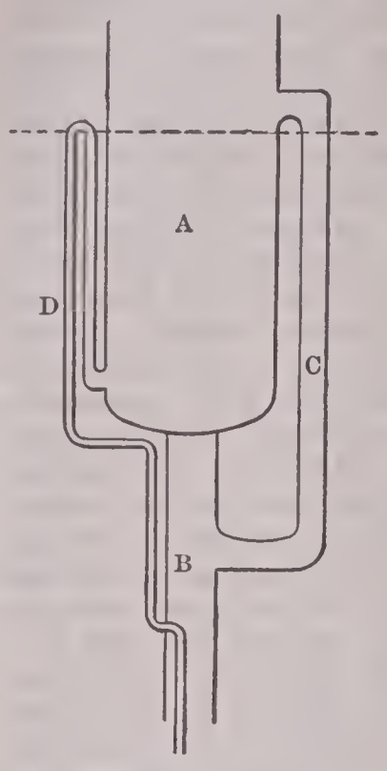
EXTRA, *ĕks′tră* [L. *extra*, on the outside, without]: a common prefix, denoting 'above or beyond usual'; in excess; additional; out of. EXTRA-PAROCHIAL, beyond the limits of any parish. EXTRA-JUDICIAL, out of ordinary court procedure. EXTRA, a. beyond what is usual, or has been agreed upon; additional, as *extra* work, *extra* hours, *extra* quantity. EX′TRAS, n. plu. *-trăs*, things in addition to what is due or expected. EXTRA-AXILLARY, *-ăks′ĭl-ẽr-ĭ*, in *bot.*, removed from the axil of the leaf, as in the case of some buds. EXTRA-BELIEF, n. Matthew Arnold's rendering of the German *Aberglaube*, which does not consider adequately translated by the word superstition. EXTRA-CONSTELLARY, a. *-kŏn-stĕl′lẽr-ĭ* [prefix *extra;* Eng. *constellary*]: in *astron.*, term applied to stars not classed under any constellation. EXTRA-DOTAL, a. *-dō′tal*, not belonging to dower; as, *extradotal* property. EXTRA-FOLIACEOUS, a. *ĕks-tra-fō-lī-ā′shŭs*, in *bot.*, beyond a leaf; away from the leaves or inserted in a different place from them. EXTRA-MUNDANE, *-mŭn′dān* [L. *mundus*, the world]: beyond the limits of the material world. EXTRA-MURAL, *-mūr′ăl* [L. *murus*, a wall]: without or beyond the walls, as of a fortified city, or of a university. EXTRA-PROFESSIONAL, not within the usual limits of professional business or habits. EXTRA-PROVINCIAL, a. *-prō-vĭn′shal*, out of or beyond the limits of the same province or jurisdiction; not under the jurisdiction of the same archbishop. EXTRA-REGULAR, a. *-rĕg′ū-lar*, out of rule; beyond ordinary rules. EXTRA-TERRITORIALITY, n. *-tĕr-rĭ-tō-rĭ-al′ĭ-tĭ*, immunity from a country's laws like that enjoyed by an ambassador. EXTRA-VASCULAR, *a. -văs′kū-lar*, being out of the proper vessels,

Note.—When EXTRA is employed as a prefix, a hyphen is usually placed between it and the word.

EXTRACT, v. *ĕks-trăkt'* [L. *extractus*, drawn out or forth—from *ex*, out of; *tractus*, drawn or dragged]: to draw out; to take out or from; to select: N. *ĕks'-trăkt*, that which is drawn out or from something else; a selection, as from a book; a tincture evaporated to a paste; a decoction; in *OE.*, descent. EXTRAC'TING, imp. *-trăk'tĭng*. EXTRAC'TED, pp.: ADJ. drawn or taken out. EXTRAC'TIBLE, a. *-tĭ-bl*, that may be extracted. EXTRAC'TOR, n. *-tẽr*, that which extracts. EXTRAC'TION, n. *-shŭn* [F.—L.]: the act of drawing out or from; birth; lineage; descent. EXTRAC'TIVE, a. *tĭv*, that may be extracted; term applied to certain organic matters resembling humine, found in soils during decay of vegetable matter, and precipitated during the concentration of water solutions. EXTRACTUM CARNIS, *ĕks-trăk'tŭm kâr'nĭs* [L. extract of flesh], or EXTRACT OF MEAT, obtained by acting on chopped meat by cold water, and gradually heating, when about one-eighth of the weight of the meat dissolves out, leaving an almost tasteless insoluble fibrine. The extract of meat contains the salts and savory constituents of the meat, and is a light and stimulating article of food: see BEEF-TEA: BROTH. It may be concentrated into small bulk, and may be afterward treated with water, and being heated, forms an agreeable light soup, stimulating rather than nutritious: see PRESERVES.

EXTRACTION APPARATUS. It frequently happens that it is necessary to separate substances by taking advantage of their differences of solubility in a given liquid. Thus, for example, sugar and sand may be separated by treatment with water. The simplest plan is to stir the mixture with the liquid for a sufficient length of time, allow the sand to settle and pour off the sugar solution, if necessary passing it through a filter (see FILTRATION). When time and material have to be economized this process is inadequate and some arrangement may be employed by which the liquid is supplied in a steady stream so directed as to come first into contact with material which is nearly exhausted of its soluble constituent, whereas, at the end of its course, the liquid encounters material richest in soluble substance. In this manner the maximum amount of soluble body is removed by the minimum quantity of solvent. This plan is adopted in the manufacture of sodium carbonate (q.v.) by the Le Blanc process. The mixture of this salt with coal, limestone, calcium, sulphide and other compounds is run from the furnace into steel trucks which are treated with water in series, fresh material being added at one end exhausted trucks removed at the other. It often happens, however, that it is necessary to operate with a liquid which is costly and which must be used repeatedly on account

of the sparing solubility in it of the extractive material, or because it is desirable to reduce the bulk of the liquid as much as possible. The best known apparatus for this purpose is that of Soxhlet, shown in the Fig. The substance to be extracted is placed in the wide tube A, if it is in a fine state of division it may be enclosed in filter paper. The apparatus is connected at the top of A with a condenser, not shown. The tube B is joined to a flask containing the solvent, such as water, alcohol, ether, etc. The liquid is boiled, the vapor passes through C to the condenser, where it is liquefied and drops on the substances in A. When the level of the liquid rises to the point shown by the dotted line it immediately syphons off through the narrow tube D back into the flask, where the dissolved substance remains and the solvent is again vaporised and so passes through the same cycle of operations. Apparatus on this principle, but of course on a much larger scale, are often employed for technical purposes. In addition to the advantages mentioned above, they have the valuble property of automatic action.



EXTRAC'TION OF ROOTS: process in mathematics: see EVOLUTION. The roots which have in practice to be most frequently extracted are the *square* and *cube* roots. It is proposed to explain the rule for their extraction as it is given in books of arithmetic. And first of the square root. The square of $a + b$ is $a^2 + 2ab + b^2$, and we may obtain the rule by observing how $a + b$ may be deduced from it. Arranging the expression according to powers of some letter a, we observe that the square root of the first term is a,

$$\begin{array}{rl} & a^2 + 2ab + b^2 (a + b \\ & a^2 \\ 2a + b) & \overline{\qquad 2ab + b^2} \\ & \quad 2ab + b^2 \end{array}$$

Subtract its square from the expression and the remainder is $2ab + b^2$. Divide $2ab$ by $2a$, and the result is b, the other term in the root. Multiply $2a + b$ by b, and subtract the product from the remainder. If the

operation does not terminate, it shows that there is another term in the root. In this case we may consider the two terms $a + b$ already found as one: and as corresponding to the term a in the preceding operation; and the square of this quantity having been by the preceding subtracted from the given expression, we may divide the remainder by $2(a + b)$ for the next term in the root, and for a new subtrahend multiply $2(a + b) +$ the new term, by the new term; and the process may be repeated till there is no remainder. The rule for extracting the square root of a number is an adaptation of this algebraic rule. In fact, if the number be expressed in terms of the radix of its scale, it is seen to be a concealed algebraical expression of the order we have been considering. Thus, $N = ar^n + br^{n-1} \ldots + q$. The number 576 in the denary scale may be written $5 \times 102 + 7 \times 10 + 6$; and treating it as an algebraical expression, we should find its root to be $2 \times 10 + 4$, or 24. The only part of the arithmetical rule now requiring explanation is the rule of pointing. As every number of one figure is less than 10, its square must be less than 10^2; generally, every number of n figures is less than 10^n (which is 1 followed by n ciphers); but also every number of n figures is not less than 10^{n-1}, and therefore its square is not less than 10^{2n-2}—which is the smallest number of $2n - 1$ figures. Also 10^{2n} is the smallest number of $2n + 1$ figures. It follows that the square of a number of n figures has either $2n$ or $2n - 1$ figures. If, then, we put a point over the units place of a number of which the root is to be extracted, and point every second figure from right to left, the number of points will always equal that of the figures in the root. If the number of figures be even, the number will be divided into groups of two each; if odd, the last group will contain only a single figure.

The rule for the extraction of the cube root of a number is deduced from that for the extraction of the cube root of an algebraical expression in the same way as in the case of the square root. The cube of $(a + b)$ is

$$\begin{array}{rl} & a^3 + 3a^2b + 3ab^2 + b^3 (a + b \\ & a^3 \\ \hline 3a^2) & 3a^2b + 3ab^2 + b^3 \\ & 3a^2b + 3ab^2 + b^3 \end{array}$$

Hence the rule in algebra. Arrange the expression according to descending powers of a, the cube root of the first term a^3 is a, the first term of the root. Subtract its cube from the expression, and bring down the remainder. Divide the first term by $3a^2$, and the quotient is b, the second term of the root. Subtract the quantity $3a^2b + 3ab^2 + b^3$. If there is no remainder, the root is extracted. If there is, proceed as before,

regarding $a + b$ as one term, corresponding to a in the first operation. Let, for example, $a + b = a'$, then $3a'^2$ is the new trial divisor. If c be the new term or third figure of the root, then the quantity to be subtracted to get the next remainder is $3a'^2c + 3a'c^2 + c^3$, and so on till there is no remainder. The rule of pointing in the extraction of the cube root may be proved, as in the case of the square root, by showing that the cube of a number of n figures contains $3n$, $3n - 1$, or $3n - 2$ figures; and, therefore, if we put a point over the units place, and on each third figure, we shall have as many periods as there are figures in the root.

A rule for the extraction of any root of a number may be got from considering how, from the expansion of $a + b$ to the nth power, or $a^n + na^{n-1}b +$, etc., the root $a + b$ is to be obtained: see EVOLUTION and INVOLUTION.

EXTRACTS, in Medical Usage: preparations of vegetable principles, got either by putting the plants in a solvent or menstruum, and then evaporating the liquid down to about the consistency of honey, or by expressing the juice of the plants and evaporating; this last is properly *inspissated juice*. Extracts, therefore, contain only those vegetable principles that are either held in solution in the juices of the plants themselves, or are soluble in the liquid employed in extracting them, and at the same time are not so volatile as to be lost during evaporation. Now, as many extractive matters are more or less volatile, it makes a great difference whether the operation is conducted at a low or at a high temperature. Extracts are called *watery* or *alcoholic*, according as the menstruum employed is water or spirits. Ether also is used in extracting. Different plants afford different extracts, some being of the nature of bitters, others being used as pigments, tannin, etc. Extracts are liable to great uncertainty in point of strength and composition, and require to be prepared with great care. Evaporation in vacuo is found to be a great improvement.

EXTRADITION, n. *ĕks'tră-dĭsh'ŭn* [F. *extradition*—from L. *extradĭtĭōnem*—from *ex*, out of; *tradĭtĭō*, a delivering up, a surrender]: the delivering up by one government to another of any subject who has fled from justice. EXTRADITE, v. *ĕks'tră-dīt*, to deliver up to one country by another, a subject of the former who is a fugitive from justice, usually according to treaty and under certain formalities. EX'TRADITING, imp. EX'TRADITED, pp. *-dī-tĕd*—*Extradition* is always the subject of international treaty. A treaty or convention for this purpose was entered into between the United States and Great Britain 1842, and between Great Britain and France 1843. The crimes for which extradition from Great Britain is allowed were settled by the Extradition Act 1870, 33 and 34 Vict. c. 52, and in-

clude murder, manslaughter, spurious coining, forgery, larceny, false pretenses, bankruptcy offenses, rape, abduction, child-stealing, burglary, arson, robbery, threats to extort money, sinking of ships, revolt and assaults in ships; but there is no surrender if the offense is one of a political character. The surrender is effected through the intervention of the sec. of state, and it is by the secretary's warrant that the alleged criminal is finally handed over with the depositions to the foreign state making the requisition.

The practice of the United States government both as to demanding from, and surrendering fugitive criminals to, foreign governments is regulated entirely by treaty. The first general law on the subject was enacted by congress 1848, and recognizes this principle. The separate American states have no power to surrender fugitive criminals at the demand of a foreign government. They may and do surrender such criminals to each other. The extraditable crimes usually specified are: arson, assassination, assault with intent to commit murder, burglary, circulation or fabrication of counterfeit money; counterfeiting public bonds, bank bills, securities, stamps, dies, seals, and marks of state and administrative authority; embezzlement of public money, embezzlement by public officers, embezzlement by persons hired or salaried, utterance of forged paper, forgery, infanticide, kidnapping, larceny, murder, mutiny, mutilation, parricide, piracy, poisoning, rape, and robbery. Some treaties also include bigamy, fraudulent bankruptcy, fraudulent barratry, and intentional injuries to railroads and telegraph lines.

EXTRADITION, INTERSTATE. The New England Confederation of 1643 provided for mutual extradition of criminals between the different provinces; the Articles of Confederation did likewise; and the Constitution provides for it between the States, which are independent countries in all save the functions they have resigned to the general government. But the wording of the provision, though as definite as it can safely be made, leaves room for the widest difference in construction, and the evasion of the mandate in a large share of the cases that arise. It is: 'A person charged in any State with treason, felony, *or other crime*, who shall flee from justice, and be found in another State, shall, on demand of the executive authority of the State from which he fled, be delivered up, to be removed to the State having jurisdiction of the crime.' But must the offense be a crime by the law of the State requisitioned as well as of the State demanding? The judicial decisions say decidedly no—that 'the obligation to surrender the fugitive . . . is the same as if the alleged act was a crime by the laws of both.' On the other hand, the State executives, for obvious reasons, have stubbornly refused to tie

their hands from exercising discretion, and have again and again acted on the theory that the offense must be a crime by the law of their own State. Thus, in the Dorr Rebellion, Gov. Cleveland of Connecticut refused to extradite Dorr—though Dorr was actually using Connecticut soil to organize an attack on Rhode Island—on the ground that the latter's treason laws were not valid outside itself; and Gov. Seward of New York refused to surrender persons charged with stealing slaves (though his predecessor had done so), on the ground that it was not a crime by New York law, by common law, or the common consent of civilized nations. Even the principles of decision are not agreed upon. In some States the courts hold that the courts of the State making the demand are entitled to decide as to the sufficiency of the cause; in others their own courts make their own law without regard to that of the other States. Still another question is, whether the governor has any discretion in the matter, supposing his State law to demand extradition. The answer is somewhat startling; it is, that the governor legally has no discretion, that he is imperatively bound to issue the warrant, but if he does refuse there is no power to compel him and no punishment for the refusal. The Constitution, in other words, has issued an imperative mandate with no provision for its enforcement. Indeed, it is difficult to see how there could be any; the only remedy being a State impeachment of its executive for malfeasance, which is out of the question in such cases. The forms of interstate extradition are provided in the act of 1793. The accused must be indicted in the State where the offense is committed; if the magistrate before whom the charge is brought is satisfied of its truth, he issues a warrant for the arrest of the criminal, and a copy is forwarded to the executive of the State, who makes requisition for the fugitive's surrender on the executive of the State to which he has fled. If the latter is satisfied of the legality of the process and the sufficiency of the evidence of guilt, he is to issue a warrant for surrender; but habeas corpus proceedings may always be interposed. The expense of the proceedings and transportation is borne by the State making the demand.

EXTRADOS, n. *ĕks-trā′dŏs* [F. *extrados*—from L. *extra*, on the outside, and F. *dos;* L. *dorsum*, the back]: the exterior curve of an arch. EXTRA′DOSED, a. *-trā′-dŏst*, in *arch.*, term applied to an arch when the curves of the intrados and extrados are concentric and parallel.

EXTRA-JUDICIAL, EXTRA-MUNDANE, EXTRA-MURAL, etc.: see under EXTRA.

EXTRANEOUS, a. *ĕks-trā′nĭ-ŭs* [L. *extrānĕŭs*, external, outward—from *extra*, without]: foreign; not belonging to a thing; without or beyond a thing. EXTRA′NEOUSLY, ad. *-lĭ*. EXTRANEITY, n. *ĕks′trā-nē′ĭ-tĭ*.

state of being foreign; state of being without or beyond a thing. EXTRANEOUS MODULATION, n. *mŏd-u-lā-shŭn*, in *mus*, modulation to an extreme or unrelated key.

EXTRAORDINARY, a. *ĕks-trŏr'dĭ-nėr-ĭ or ĕks'trā-ŏr'-dĭ-nėr-ĭ* [F. *extraordinaire*—from *L. extrăŏrdĭnārĭŭs*, out of the common order—from *extra*, beyond; *ordo*, arrangement, order: It. *extraordĭnario*]: beyond ordinary or usual; uncommon; remarkable; special. EXTRAOR'-DINARILY, ad. *-nėr-ĭ-lĭ*, in a manner out of the common method and order; remarkably; in an uncommon degree. EXTRAOR'DINARIES, n. plu. *-nėr-ĭz*, unusual things.

EXTRAUGHT, v. *ĕks-trawt'*: in *OE.*, the old pp. of *extract; extracted;* sprung from; descended.

EXTRAVAGANT, a. *ĕks-trăv'ă-gănt* [F. *extravagant* —from L. *extravăgăn'tem*—from L. *extra*, without or beyond; *vagans*, wandering—*lit.*, wandering out of proper bounds]: excessive; wasteful; unreasonable; vainly expensive; not within ordinary limits of truth or probability. EXTRAV'AGANTLY, ad. *-lĭ*. EXTRAV'-AGANCE, n. *-găns* [F.—L.]: excess in anything; a going beyond the limits of strict truth or probability; also EXTRAV'AGANCY, *n. -sĭ*. EXTRAV'AGANTS, n. plu. certain decretal epistles or constitutions of the popes. EXTRAV'AGAN'ZA, n. *-gan'zā*, [It]: an unusual or irregular piece of music; a burlesque on the stage. EXTRAVAGAN'ZIST, n. *-zĭst*, extravagant or eccentric person; writer of extravaganzas.—SYN. of 'extravagance': excess; prodigality; wildness; irregularity; profusion; waste; dissipation; outrage; violence; bombast; —of 'extravagant'; prodigal; lavish; profuse; irregular; unrestrained; wild; uncontrolled.

EXTRAVASATE, v. *ĕks-trăv'ă-sāt* [F. *extravasar*— from L. *extra*, without, and *vas*, any kind of vessel]: to let or flow out of the proper vessels, as blood out of veins. EXTRAV'ASATING, imp. EXTRAV'ASATED, pp: ADJ. forced out of the arteries, veins, etc., as the blood by which the skin is discolored in bruises. EXTRAV'ASA'TION, n. *sā'shŭn* [F.—L.] the act of flowing out of the proper ducts or vessels, through ruptures or injuries in their walls, as blood or any fluids of the living body, into the surrounding tissues; the effusion of the blood after the rupture of a vessel. Excrementitious matter thus sometimes escapes into the abdomen through a wound or ulceration of the bowels. But the term is oftenest used in speaking of the escape of blood from injured blood-vessels. Extravasation is distinguished from exudation by this, that in the last the vessels remain entire, and the effusion takes place by filtration through their walls; nor does more than a part of the blood so escape, the blood globules being retained, while in extravasation perfect blood is effused. Many kinds of extravasation may be immediately fatal, such as that of urine or of gall into the abdomen, or of blood from the vessels of the brain in cases

of apoplexy. The dark color resulting from a bruise is owing to extravasated blood from ruptured capillary vessels.

EXTREAT, n. *ĕks-trēt′* [Norm. F. *estraite*]: in *OE*, extraction.

EXTREME, a. *ĕks-trēm′* [F. *extrême*—from L. *extrēmus*, the outermost, last: It. *estremo*]: furthest; outermost; utmost; most violent; highest in degree; most pressing; rigorous; strict: N. that part which terminates; utmost point. EXTREMES′, n. plu. *-trēmz′*, what are furthest distant from each other. EXTREME′LY, ad. *-lĭ*. EXTREM′ITY, n. *-trĕm′ĭ′tĭ* [F. *extrémité*]: the utmost point; the verge; the greatest rigor or violence; necessity; the utmost distress. EXTREM′ITIES, n. plu. *-tĭz*, the parts most remote from the middle: limbs as opposed to the trunk or head. EXTREME UNCTION: *see* UNCTION.—SYN. of 'extremity'; border, extreme; termination; close; end; limit.

EXTREME AND MEAN RATIO, in Geometry: a line AB is divided in extreme and mean ratio by a point P when $AB.BP=AP_2$. This division of a line, which is also known as the *median section* or *golden section*, is employed frequently in Euclidean geometry, notably in the inscription of a regular pentagon in a circle.

EXTREME UNC'TION [see UNCTION]: sacrament of the Rom. Cath. Church, which, as the other sacraments supply spiritual aid in the various circumstances of life, is believed to impart to the Christian in death grace and strength to encounter the struggle, as well spiritual as bodily, of the dying hour. The rite of unction in different forms is common to several of the sacraments; the name 'extreme' given to that of the present sacrament, denotes that it is reserved for the last act of the Christian career. The council of Trent declares this sacrament, though 'promulgated' in the well known passage of St. James, v. 14, 15 (which Protestants regard as having more to do with the general belief in the sanative properties of oil), to have been 'instituted' by Christ. The Fathers frequently allude to the rite of unction, and though many of these allusions certainly refer to the unctions of baptism and confirmation, yet Rom. Catholics rely on several passages of Origen, Chrysostom, Cæsarius of Arles, and Pope Innocent I., as decisive regarding the unction of the dying, as also upon the fact that in the various separated churches of Oriental Christians—Greek, Coptic, Armenian, and Nestorian—the rite is found, though with many ceremonial variations. In the Rom. Cath. Church, the sacrament is administered by the priest, who, 'dipping his thumb in the holy oil, anoints the sick person in the form of the cross upon the eyes, ears, nose, mouth, hands, and feet; at each anointing making use of this form of prayer: "Through this holy unction, and his most tender mercy, may the

Lord pardon thee whatever sins thou hast committed by thy sight. Amen." And so of the hearing and the rest, adapting the form to the several senses.'—Challoner's *Catholic Christian Instructed.* Extreme Unction is reputed by Catholics one of the sacraments 'of the living;' that is, it ordinarily requires that the recipient should have previously obtained remission of his sins by absolution or by perfect contrition; but it is held to remit, *indirectly,* actual sins not previously remitted, and also (though not infallibly, but according to the merciful designs of Providence) to alleviate, and even to dispel, the pains of bodily disease. The holy oil which forms the 'matter' of this sacrament, must be blessed by the bishop—a ceremony performed with great solemnity once each year by the bishop, attended by a number of priests, on Maundy-Thursday. In the Greek Church, the sacrament is administered by several priests conjointly. In its most solemn form, seven priests unite in its administration; in ordinary circumstances, it is conferred by two. The Greek form of words differs, though not substantially, from that of the Latin Church. The Greeks call this sacrament 'The Holy Oil,' and sometimes 'The Oil of Prayer.'

EXTRICATE, v. *ĕks'trĭ-kāt* [L. *extricātus,* disentangled—from *ex,* out of; *trĭcæ,* trifles, hindrances]: to free from difficulties or perplexities; to disentangle; to set free. Ex'tricating, imp. Ex'tricated, pp. Ex'tricable, a. *-kă-bl,* that may be extricated. Ex'tricably, ad. *-bli.* Ex-trica'tion, n. *-kā'shŭn,* a freeing from perplexities; disentanglement..—Syn. of 'extricate': to disengage; relieve; set free; disembarrass; evolve.

EXTRINSIC, a. *ĕks-trĭn'sĭk,* Extrin'sical, *a. -sĭ-kăl* [OF, *extrinseque,* outward—from L. *extrĭnsĕcus,* from without, on the outside—from *exter,* outward; *sĕcus,* by, beside, or simply 'side': F. *extrinsèque*]: without, but yet near to, external; outward; not contained in or belonging to a body. Extrin'sically, ad. *-lĭ.*

EXTROSE, a. *ĕks-trōrs'* or Extror'sal, *a. -trŏr'sāl* [L. *extra,* on the outside; *orrus,* beginning, in *bot.,* applied to anthers in which the slit through which the pollen escapes is toward the outside of the flower, and not, as usual, toward the pistil.

EXTROVERSION, n. *ĕks-trō-vĕr'shun* [L. *extra,* beyond, without; *versio,* a turning]: in *surg.,* turning of an organ inside out; as, for example, the bladder.

EXTRUDE, v. *ĕks-trôd'* [L. *extrūdĕrĕ,* to thrust out—from *ex,* out of; *trūdo,* I thrust: It. *estruderc*]: to thrust out; to expel; to force or press out. Extru'ding, imp. Extru'ded, pp. Extru'sion, n. *trô'zhŭn,* [L. *extrūsŭs,* thrust out]: the act of thrusting or driving out; expulsion.

EXUBERANT, a. *ĕks-ū′bĕr-ănt* [*F. exubérant;* L. *exŭbĕran′tem,* being in great abundance—from *ex,* out of; *ūbĕr,* fruitful, fertile: It. *esuberante*]: plenteous in a high degree; luxuriant; over-abundant. EXU′BERANTLY, ad. *lĭ.* EXU′BERANCE, n. *-ăns* [F.—L.]: or EXU′BERANCY, n. *-ăn-sĭ,* an overflowing quantity; superfluous abundance; richness; luxuriance.—SYN. of 'exūberance'; excess; abundance; plenty; copiousness; rankness; overflow; overgrowth; wantonness; superfluity.

EXUCONTIANS, n. *ĕks-ū-kŏn′shĭ-anz* [Gr. *exoukontōn,* from persons or things not existing]: Arian sect which arose in the 4th c. They held that Christ might indeed be called God, and the Word of God, but only in a sense consistent with his having been brought forth from non-existences, that is, that there was a time when he did not exist, and that consequently he was but a creature.

EXUDE, v. *ĕks-ūd′* [L. *exsūdārĕ,* to sweat out—from *ex,* out of; *sŭdo,* I sweat]: to discharge the moisture or juices of an animal or a plant through its skin or surface; to flow from a living body through an opening or incision. EXU′DING, imp. EXU′DED, pp. EX′UDA′TION, n. *-ū-dā-shŭn,* a discharge of moisture from animal bodies or from plants; that which has been exuded.

EXULT, v. *ĕgz-ŭlt′* [L. *exultārĕ,* to leap and frisk about—from *ex,* out of; *saltārĕ,* to leap or dance: It. *esultare*]: to leap or dance, as for joy; to rejoice exceedingly; to be glad above measure: to triumph. EXULT′ING, imp.: ADJ. rejoicing greatly. EXULT′ED, pp. EX′ULTA′TION, n. *-ŭl-tā′shŭn* [F.—L.]: the act or state of rejoicing greatly; great gladness; triumph. EXUL′TANT: a. *-tănt,* rejoicing triumphantly. EXUL′TINGLY, ad. *-lĭ.*

EXUMAS, *ĕks-ô′mâz:* comprising great Exuma, Little Exuma, and the Exuma Keys; part of the group of the Bahama Islands. The inhabitants are employed partly in agriculture, including at one time the growing of cotton, but chiefly in salt-making, in which the Exumas rank second among all the subdivisions of the group. They have exported as much as 116,000 bushels of salt a year. Next to Nassau in New Providence, Little Exuma is the most considerable port of entry in the Bahamas. Pop. of the group, abt. 2,000.

EXUSTION, n. *ĕks-ŭst′yŭn* [L. *exŭstĭōnem,* a consuming by fire—from *ex,* out of; *ustus,* burnt]: the act of burning or consuming by fire.

EXUVIÆ, n. plu. *ĕgz-ū′vĭ-e* [*L. exŭvĭæ,* things laid aside or taken off from the body]: things of any kind cast off and left; cast off skins, shells, etc., of animals; in *geol.,* formerly all fossil animal matter or fragments of animals of any description, now seldom used in this sense. EXU′VIABLE, a. *-ă-bl,* that may be cast or thrown

off. EXU'VIA'TION, n. *-ā'shŭn,* the process by which animals, such as the crustaceans, serpents, etc., throw off their old coverings and assume new ones. EXUTIVE, a. *ĕks-ū-tĭv,* in *bot.,* applied to seeds wanting the usual integumentary coverings.

EX VOTO, n. *ĕks vō'tō* [L.from, or in accordance with a vow]: something offered to some divinity either in gratitude for an exemplary favor, or to obtain such benefit. Roman *ex votos* consisted usually of paintings representing the particular danger from which the person had been delivered. Pictorial *ex votos* are common in Rom. Cath. churches in Europe, and as they are not of a high order of art, it is usual in the slang of the *ateliers,* to call a daub an ex voto. In the 5th c. it had become usual to offer gold and silver eyes to the saints in the churches, in acknowledgment of cures; and *ex votos* in the shape of pictures, models of diseased or wasted limbs, and even walking sticks and crutches may be seen suspended near the altars of the Virgin and the saints in many churches, notably at Notre Dame des Victoires, in Paris, and at Lourdes.

EYALET, *ā-yâ-lĕt,* or VILAYET, *vī-lâ-yĕt':* largest and most important class of the administrative divisions of the Turkish empire, formerly known as pashalics. These are again divided into *livas* or *sanjaks,* the livas into *cazas* or districts, and the cazas into *nahiés* or communes, containing villages and hamlets. Each eyalet or general government, as it may be called, is administered by a pasha, who is governor, and the general name for whom is *vali* or viceroy. The governors of the eyalets belong to the Dignities of the Sword, and are pashas of two tails; and when they are raised to the rank of vizier, as is frequently the case, they become pashas of three tails.

EYAS, n. *ī'ăs*: see under EYRIE.

EYCK, *īk,* HUBERT VAN: illustrious painter of the old Flemish school: abt. 1366–1426, Sep. 18; b. Maas-Eyck. Hubert, with his younger brother and pupil, Jan, resided chiefly at Bruges and Ghent, and they became the founders of the Flemish school of painting. Hubert is among the greatest names of the 15th c. in ecclesiastical art; certainly the greatest outside of Italy. Though lacking in scientific perspective, he commands admiration by his vigor of conception, his careful finish, and his clearness and richness of color. The honor of being the inventor of oil-painting is claimed for him, though sufficient evidence has been adduced to show that it was practiced previously. Before his time, the custom, however, particularly in Italy, was to paint with gums or other substances of an adhesive nature dissolved in water; and if not the inventors, the brothers were at least the first who brought into notice and perfected the mode of mixing colors with oil or some medium of which oil was the chief ingredient; while,

for transparent and brilliant coloring and minute finish, their works have never been surpassed. Till the death of Hubert, the brothers generally painted in conjunction: one of their most important works was an altar-piece with folding-doors, representing the Elders adoring the Lamb—a subject from the Apocalypse—painted for *Jodocus Vyts,* who presented it to the cathedral of St. Bavon, in Ghent. The two central divisions of this picture are all that remain in the church at Ghent. Some of the wings are in the Gallery at Berlin. The master-pieces of the brothers are for the most part in the cities of Ghent, Bruges, Antwerp, Berlin, Munich, and Paris. See EYCK, JAN VAN.

EYCK, JAN VAN: illustrious painter of the old Flemish school: b. Maas-Eyck, 1370 (as some suppose, though Kugler—usually good authority on ancient art—dates his birth 1400); d. Bruges 1440–1; brother of Hubert. Jan, who had the advantage of his brother's teaching and experience and besides had sojourned in sunnier southern lands, left work which cannot be called inferior to Hubert's—possibly superior in some points of graceful effect, while lacking something of the older brother's spiritual grandeur. In the National Gallery, London, there are three pictures by Jan van Eyck, which, though small, well exemplify the high qualities of his works, and show him able to work fully in the spirit of his brother. These are portraits of a Flemish merchant and his wife, standing in the middle of an apartment, with their hands joined—signed and dated 1434: of the portrait of a man in a cloak and fur-collar, with a red handkerchief twisted around the head as a turban—painted according to an inscription on the lower part of the frame, 1433, Oct. 21; and portrait of a man with a dark-red dress, with a green head-covering—signed and dated 1432, Oct. 10. Compare Waagen, *Ueber Hub. und Jan van Eyck* (Breslau, 1822); Hotho, *Die Malerschule E.'s* (1858). See EYCK, HUBERT VAN.

EYE, n. ī [AS. *eage;* Icel. *auga;* Goth. *augo;* Ger. *auge;* L. *ocŭlŭs,* the eye]: the organ of sight or vision; sight; view; notice; observation; a small loop or ring; a bud; a very small perforation; V. to watch or keep in view; to watch narrowly. EYING, imp. *ī'ĭng.* EYED, pp. *īd:* ADJ. having eyes. EYEN, or EYNE, n. *ī'n,* in *OE.,* eyes; the plu. of *eye.* EYER, n. *ī'ẽr,* one who. EYE'LESS, a. without eyes. EYE-BEAM, n. a beam or glance of the eye. EYE-BOLT, n. in *naut.,* bolt having an eye or loop at one end for the reception of a ring, hook, or rope. The insertion of a closed ring into the eye converts it into a ring-bolt. EYE-CUP, n. cup for washing the eyeball. Its lip fits snugly around the inner circle of the orbit and is brought in contact with the ball, the lid being opened, by bending the head backward. EYE-DROP, n. a tear; also a local fluid ap-

plication dropped into the eye, usually employed to dilate the pupil—generally in the plural, eye-drops. EYE-FLOP, n. a blinker on a horse's bridle. EYE'FUL, a. filling or attracting the eye; visible; remarkable. EYE-GLASSES, spectacles or lenses made of glass to assist the sight. EYE-HEADED, a having an eye or aperture in the head. A form of bolt having an eye at the head end; intended for securing together two objects at right-angles. EYE-HOLE, n. circular opening in a bar, etc., to receive a pin, hook, rope, or ring. EYE-SERVANT, one who works only when watched. EYE-SERVICE, service only under the eye of a master. EYE-STONE, a name given to those varieties of circle agate which show, in the center, a spot or spots more highly colored than the concentric layers; name given to a smooth stone still sometimes used for removal of foreign substances from the eye; it is inserted under the eye-lid, and moving with the motion of the eye, carries out the intruding fragment. EYE-TOOTH, one of the two pointed teeth of the upper jaw, one under each eye, the canine tooth. EYE-WITNESS, one who sees the thing done; one who has seen. EYEBALL, the ball or apple of the eye. EYEBROW, n. the brow or hairy arch above the eye. EYELASH, n. one of the line of hair that edges the eye-lid. EYELET, n. *ī'lĕt*, or EYELET-HOLE [F. *œillet*, a little eye—from OF. *œil*—from L. *ocŭlŭs*, the eye]: a small hole or perforation to receive a lace or cord, also to admit light. EYELET-PUNCH, n. device used at the desk for attaching papers together by eyeleting. It has usually a hollow punch for making a hole, and a die-punch to upset the flange of the eyelet. EYELETEER, same as stiletto. EYELID, n. one of the two folds of skin meeting over the front of the eyeball when the eye is closed. EYE-PIECE, in a *telescope* or *microscope*, the lens or lenses at the end of the instrument which is applied to the eye (see TELESCOPE). EYE-RIM, n. circular single eye-glass, adapted to be held to its place by the construction of the orbital muscles. EYE-SALVE, ointment for the eyes. EYE-SHOT, a sudden glance of the eye; view. EYESIGHT, n. view; observation; the sense of seeing. EYESORE, n. something offensive to the sight. EYE-SPECULUM, n. instrument for keeping the eyelids apart, to expose the exterior portions of the eye and its adjuncts. EYE-SPLICE, n. in *naut.*, a splice made by turning the end of a rope back on itself and splicing the end to the standing part, leaving a loop. EYE-SPOT, n. a kind of lily of a violet or black color, with a red spot in the middle of each leaf. EYE-STRINGS, n. the strings or tendons by which the eye is moved. EYED HAWKMOTH, in *entom.*, *Smerinthus ocellatus;* the *sphinx ocellata* of Linnæus: See HAWKMOTH. IN THE EYE OF THE WIND, in the position of direct opposition to it. TO HAVE AN EYE TO, to be on the lookout in a certain direction. TO HAVE AN EYE ON, to observe closely; to watch strictly. UNDER THE EYE,

under close inspection or observation. With an eye to, looking closely and narrowly towards a thing, particularly with a view to personal advantage. Eyeliad, n. *ī'lĭ-ăd* [F. *œillade*, a glance, a leer—from *œil*, the eye]: in *OE.*, a glance of the eye.

EYE, Anatomy and Physiology of the: including: 1. The structure of the human eyeball, and of certain accessory parts or appendages which serve to protect that organ, and are essential to the due performance of its functions. 2. The most striking modifications which this organ presents in some of the lower animals. 3. The special uses of the various parts of the eye considered as an optical instrument. 4. The action of the retina.

1. The *globe of the eye* is placed in the anterior part of the cavity of the Orbit (q.v.), in which it is held in position by its connection with the optic nerve posteriorly, and with the muscles which surround it, and by the eyelids in front. It is further supported behind and on the sides by a quantity of loose fat, which fills up all the interstices of the orbit, and facilitates the various movements of which the eye is capable.

The form of the eyeball is nearly spherical; but on viewing the organ in profile, we see that it is composed of segments of two spheres of different diameters. Of these, the anterior, formed by the transparent cornea, has the smaller diameter, and its therefore the most prominent; and hence the antero-posterior slightly exceeds (by about a line) the transverse diameter. The radius of the posterior or sclerotic segment is about $\frac{19}{40}$ths, and that of the anterior segment about $\frac{13}{40}$ths of an inch.

When the eyes are in repose, their antero-posterior axes are parallel; the optic nerves, on the other hand, diverge considerably from their commissure within the cavity of the skull to the point where they enter the globe; consequently, their direction does not coincide with that of the eye. Each nerve enters the back of the globe at a distance of about $\frac{1}{8}$th of an inch on the inner side of the antero-posterior axis of the eye.

The eyeball is composed of several investing membranes, and of certain transparent structures, which are inclosed within them, and which, together with the cornea (one of the membranes), act as refractive media of various densities upon the rays of light which enter the eye.

The outermost coat of the eye is the *sclerotic* (from *skleros*, hard). It is a strong, dense, white, fibrous structure, covering about four-fifths of the eyeball, and leaving a circular deficiency anteriorly, which is occupied by the cornea. Posteriorly, it is perforated by the optic nerve, and it is there continuous with the sheath which that nerve derives from the dura mater, the fibrous investment of the brain and spinal cord.

Near the entrance of the nerve, its thickness is about $\frac{1}{20}$th of an in.; from this it diminishes to about $\frac{1}{40}$th; but in front it again becomes thicker, from the tendinous insertions of the straight muscles which blend with it. This coat, by its great strength and comparatively unyielding structure, maintains the inclosed parts in their proper form, and serves to protect them from external injuries.

The *cornea* (so called from its horny appearance) is a transparent structure, filling the aperture left in the anterior part of the sclerotic. Its circumference is overlaid by the free edge of the sclerotic, which in some parts presents a groove, so as to retain it more firmly;

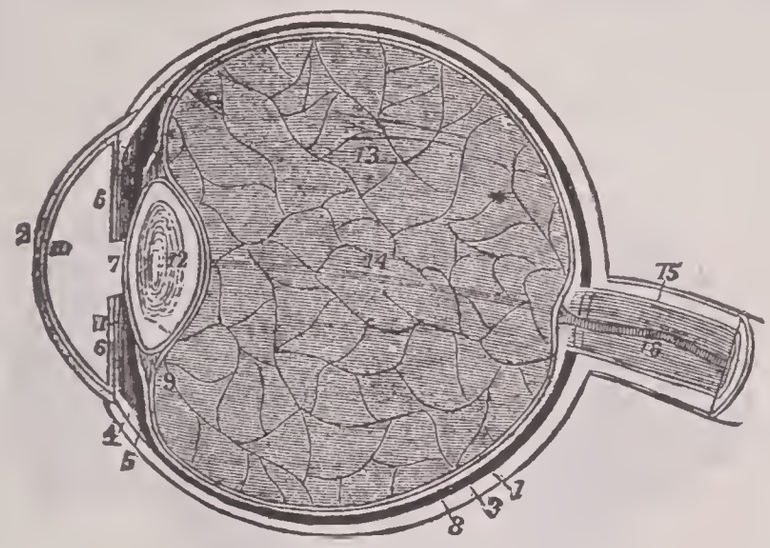


Fig. 1.

A longitudinal section of the coats of the eye.

1, the sclerotic, thicker behind than in front; 2, the cornea; 3, the choroid; 6, the iris; 7, the pupil; 8, the retina; 10, the anterior chamber of the eye; 11, the posterior chamber; 12, the crystalline lens, inclosed in its capsule; 13, the vitreous humor inclosed in the hyaloid membrane, and in cells formed in its interior by that membrane; 15, the sheath; and 16, the interior of the optic nerve, in the centre of which is a small artery. (The other numbers in the figure refer to parts not noticed in this article.)

and the connection by continuity of texture between the two structures is so close, that they cannot be separated in the dead body without considerable maceration.

The cornea, in consequence of its greater convexity, projects beyond the line of the sclerotic; the degree of convexity, however, varies in different persons, and at different periods of life. It is thicker than any part of the sclerotic, and so strong as to be able to resist a force capable of rupturing that tunic.

Although beautifully transparent, and appearing to be homogeneous, it is in reality composed of five layers, clearly distinguishable from one another—viz. (proceeding from the front backward). I. The conjunctival layer of epithelium. It is in this epithelium that particles of iron, stone, etc., forcibly driven against the eye, usually lodge, and it is a highly sensitive mem-

brane. 2. The anterior elastic lamina forming the anterior boundary of the cornea proper; it is not more than $\frac{1}{2000}$th of an in. in thickness; and its function seems to be that of maintaining the exact curvature of the front of the cornea. 3. The cornea proper, on which mainly the thickness and strength of the cornea depend. 4. The posterior elastic lamina, an extremely thin membrane, in which no structure can be detected. It probably contributes, like the anterior lamina, to the exact maintenance of the curvature of the cornea, so necessary for correct vision. 5. The posterior epithelium of the aqueous humor, probaby concerned in the secretion of the fluid.

The *choroid coat* is a dark colored vascular mem-

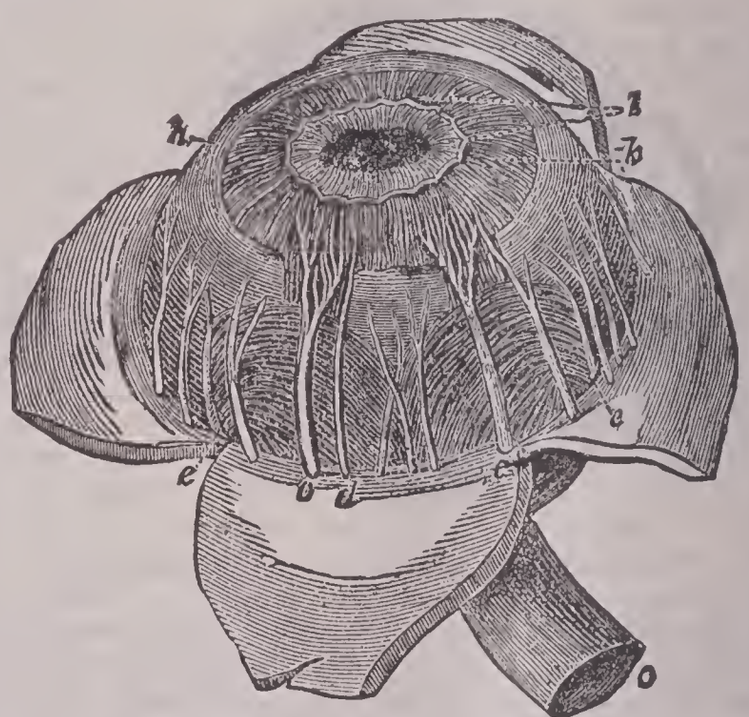


Fig. 2.

Choroid and iris, exposed by turning aside the sclerotic.

c, ciliary nerves going to be distributed in iris: *d*, smaller ciliary nerves; *e, e*, veins known as vasa vorticosa; *h*, ciliary ligament and muscle; *k, l*, converging fibres of iris; *o*, optic nerve.

brane, brought into view on the removal of the selerotic. Its outer surface, nearly black, is loosely connected with the sclerotic by connective tissue, in which are contained certain nerves and vessels—termed the ciliary nerves and vessels—which go to the iris. Its inner surface is soft, villous, and dark-colored. In front, it is attached to the membrane of the vitreous humor (see fig. 3) by means of the ciliary processes. which consists of about 60 or 70 radiating folds. These are alternately long and short, and each is terminated by a small free interior extremity; and they are lodged in corresponding folds in the membrane of the vitreous humor. In other parts, it is loosely connected with the retina. The choroid is composed of minute ramifica-

tions of vessels—especially of veins, which, from their whirl-like arrangement, are termed *vasa vorticosa*—of connective tissue, and of pigment cells, which usually approximate to the hexagonal form, and are about $\frac{1}{1000}$th of an in. in diameter. In albinos, this pigment is absent, and hence their eyes have a pink appearance, which is due to the unconcealed blood in the capillaries of the choroid and iris.

The *iris* may be regarded as a process of the choroid, with which it is continuous, though there are differences of structure in the two membranes. It is a thin flat membranous curtain, hanging vertically in the aqueous humor in front of the lens, and perforated by the pupil for the transmission of light. It divides the space between the cornea and the lens into an interior (the larger) and a posterior (the smaller) chamber, these two chambers freely communicating through the pupil

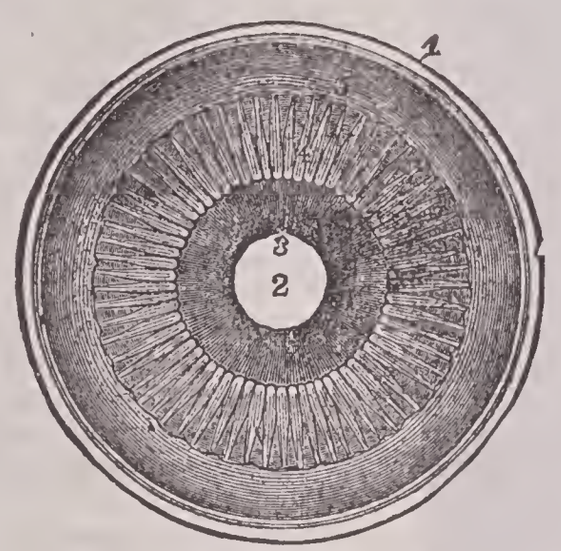


Fig. 3.

The iris and adjacent structures seen from behind.

1, the divided edge of the three coats, the choroid being the dark intermediate one; 2, the pupil; 3, the posterior surface of the iris; 4, the ciliary processes; 5, the scalloped anterior border of the retina.

(see fig. 1). The outer and larger border is attached all round to the line of junction of the sclerotic and cornea, while the inner edge forms the boundary of the pupil, which is nearly circular, lies a little to the inner side of the centre of the iris, and varies in size according to the action of the muscular fibres of the iris, so as to admit more or less light into the interior of the eyeball; its diameter varying, under these circumstances, from about $\frac{1}{3}$ to $\frac{1}{20}$ of an in. It is muscular in its structure, one set of fibres being arranged circularly round the pupil, and, when necessary, effecting its contraction, while another set lie in a radiating direction from within outward, and by their action dilate the pupil. These fibres are of the unstriped or involuntary variety. The nerves concerned in these movements will be presently noticed.

The varieties of color in the eyes of different individuals, and of different kinds of animals, depend mainly on the color of the pigment deposited in cells in the substance of the iris.

Within the choroid is the *retina*, which though continuous with the optic nerve—of which it is usually regarded as a cuplike expansion—differs very materially from it in structure. It is a delicate semi-transparent sheet of nervous matter, immediately behind the vitreous humor, and extending from the optic nerve nearly as far as the lens. On examining the concave inner surface of the retina at the back of the eye, we observe, directly in a line with the axis of the globe, a circular yellow spot *(macula lutea)*, of about $\frac{1}{20}$ of an in. in diameter, called after its discoverer, the *yellow spot of Sömmering*. There has been much discussion regarding the structure and function of this spot: Dr. Todd and Mr. Bowman, two of the most eminent English microscopists, after several examinations, regard it as a small mound or projection of the retina toward the vitreous humor, with a minute aperture in the summit. The only mammals in which it exists are man and the monkey. Its use is unknown, but vision is remarkably perfect at this spot. To the inner side of this and slightly below it, is the optic disc where the optic nerve and vessels enter the eye; vision is absent here and therefore the optic disc is often called the 'blind spots.'

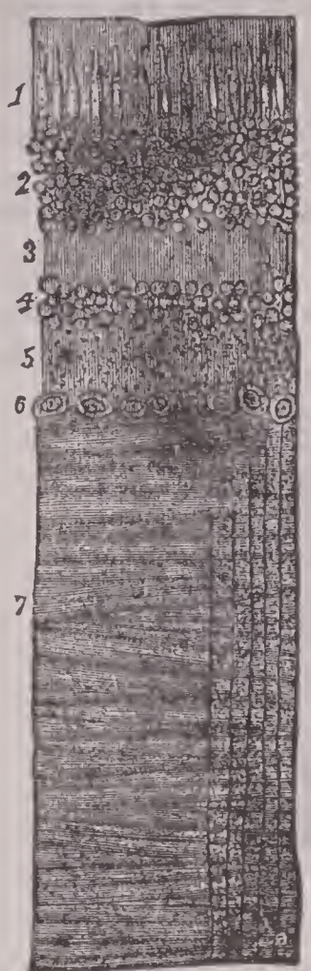


Fig. 4.

A vertical section of the human retina.

1, the layer of rods and cones (Jacob's membrane); 2, the external granular layer; 3, the intervening layer between 2 and 4, the internal granular layer; 5, finer granular layer; 6, layer of nerve-cells; 7, fibres of the optic nerve; 8, limitary membrane.

The structure of the retina, as revealed by the microscope, is in the highest degree remarkable. Although its greatest thickness (at the entrance of the optic nerve) is only about $\frac{1}{120}$ of an in., and as it extends anteriorly, it soon diminishes to $\frac{1}{220}$ of an in., the following eight layers from without inward may be distinguished in all parts of it: (1) The pigmentary layer; (2) The layer of rods and cones, frequently termed, from its discoverer, the *membrane of Jacob;* (3) The outer granular layer; (4) The outer moleculer layer; (5) The inner granular layer; (6) The inner molecu-

lar layer; (7) The layer of gray nerve substance; (8) The expansion of the optic nerve. There are also two very fine limiting membranes, the outer and the inner.

It now remains to describe the *transparent media* which occupy the interior of the globe, and through which the rays of light must pass before they can reach the retina, and form on it the images of external objects. We shall consider them in the order in which the rays of light strike them.

Immediately behind the transparent cornea is the *aqueous humor*, which fills the anterior, and posterior chambers which lie between the cornea and the lens. As its name implies, it is very nearly pure water, with a mere trace of albumen and chloride of sodium.

The *crystalline lens* lies opposite to and behind the pupil, close to the iris, and its posterior surface is received into a corresponding depression on the forepart of the vitreous humor (see fig. 1). In form, it is a double-convex lens, with surfaces of unequal curvature, the posterior being the most convex. It is inclosed in a transparent capsule.

In structure the lens is composed of laminæ which can be peeled off like the coats of an onion; these are made up of extremely minute elongated, ribbon-like structures, commonly called the fibres of the lens, arranged in a curved manner.

The lens gradually increases in density, and, at the same time, in refracting power, toward the centre; by this means, the convergence of the central rays is increased, and they are brought to the same focus as the rays passing through the more circumferential portions of the lens.

According to Berzelius, the lens contains 58 per cent. of water, 36 of albumen, with minute quantities of salts, membrane, etc. In consequence of the albumen, it becomes hard and opaque on boiling as we familiarly in the case of the eyes of boiled fish. In adult man, its long diameter ranges from $\frac{1}{3}$ to $\frac{3}{8}$, and its antero-posterior diameter from $\frac{1}{8}$ to $\frac{1}{6}$ of an in.; and it weighs three or four grains.

The *vitreous humor* lies in the concavity of the retina, and occupies about four-fifths of the eye posteriorly. Its form is shown in fig. 1. It is inclosed in the hyaloid membrane, which sends numerous processes inward, so as to divide the cavity into a series of compartments, and thus to equalize the pressure exerted by the inclosed soft gelatinous mass. Between the anterior border of the retina and the border of the lens, is a series of radiating folds or plaitings termed the *ciliary processes of the vitreous body*, into which the *ciliary processes of the choroid* dovetail. The vitreous humor contains, according to Berzelius, 98.4 per cent. of water, with a trace of albumen and salts, and hence its refractive index is almost identical with that of water.

The most important of these appendages of the eye are the *muscles within the orbit*, the *cyclids*, the *lacrymal apparatus*, and the *conjunctiva*, to which (though less important) may be added the *eyebrows*.

The *muscles* by which the eye is moved are four straight (or *recti*) muscles, and two oblique (the superior and inferior). The former arise from the margin of the optic foramen at the apex of the orbit, and are inserted into the sclerotic near the cornea, above, below, and on either side. The superior oblique arises with the straight muscles; but after running to the upper edge of the orbit, has its direction changed by a

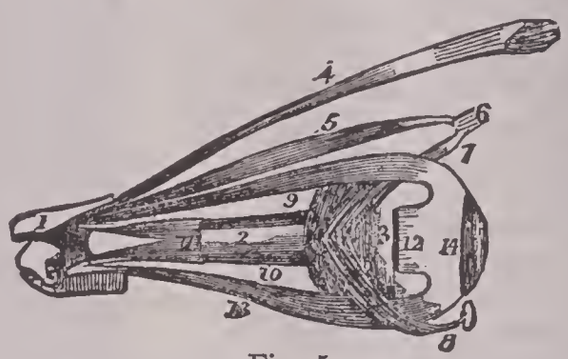


Fig. 5.

The muscles of the eyeball, the view being taken from the outer side of the right orbit.

1, a small fragment of the sphenoid bone at the back of the orbit, containing the foramen, through which, 2, the optic nerve passes; 3, the globe of the eye; 4, the levator palpebræ muscle; 5, the superior oblique muscle; 6, its cartilaginous pulley, attached to the upper edge of the orbit; 7, its reflected tendon; 8, the inferior oblique muscle, the little knob near the figure 8 being a detached fragment of the superior maxillary bone, from which it arises; 9, the superior rectus; 10, the internal rectus, partly concealed by the optic nerve; 11, 12, the two ends of the external rectus, the intermediate portion having been removed; 13, the inferior rectus; 14, the tunica albuginea, formed by the expansion of the tendons of the four recti muscles.

pully, and proceeds backward, outward, and downward (see fig. 5). The inferior oblique arises from the lower part of the orbit, and passes backward, outward, and upward. The action of the straight muscles is sufficiently obvious from their direction: when acting collectively, they fix and retract the eye; and when acting singly, they turn it toward their respective sides. The oblique muscles antagonize the recti, and draw the eye forward; the superior, acting above, directs the front of the eye downward and outward, and the inferior upward and inward. By the duly associated action of these muscles, the eye is enabled to move (within definite limits) in every direction.

The *cyclids* are two thin movable folds placed in front of the eye, to shield it from too strong light, and to protect its anterior surface. They are composed of (1) skin; (2) a thin plate of fibro-cartilage, termed the tarsal cartilage, the inner surface of which is grooved by 30 or 40 parallel vertical lines, in which

the Meibomian glands are imbedded; and (3) a layer of mucous membrane, continuous with that which lines the nostrils, and which joins the skin at the margin of the lids, in which the eyelashes (*cilia*) are arranged in two or more rows. The upper lid is much the larger; and to the posterior border of its cartilage, a special muscle is attached, termed the *levator palpebræ superioris,* whose object is to elevate the lid, and thus open the eye; while there is another muscle, the *orbicularis palpebrarum,* which surrounds the orbit and eyelids, and by its contraction closes the eye. The Meibomian glands secrete a sebaceous matter, which facilitates the free motion of the lids, and prevents their adhesion. The eyelashes intercept the entrance

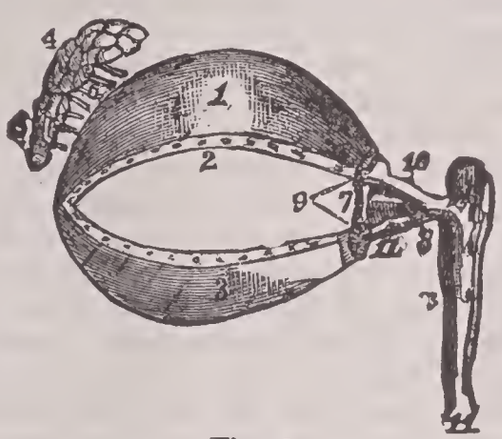


Fig. 6.

The appendages of the eye.

1, the cartilage of the upper eyelid; 2, its lower border, showing the openings of the Meibomian glands; 3, the cartilage of the lower eyelid, also showing on its border the openings of the Meibomian glands; 4, 5, the lacrymal gland; 6, its ducts; 7, the plica semilunaris; 8, the caruncula lacrymalis; 9, the puncta lacrymalia, opening into the lacrymal canals; 10, 11, the superior and inferior lacrymal canals; 12, the lacrymal sac; 13, the nasal duct, terminating at 14 in the lower meatus of the nose.

of foreign particles directed against the eye, and assist in shading that organ from an excess of light.

The *lacrymal apparatus* consists of the lacrymal gland, by which the tears are secreted; two canals, into which the tears are received near the inner angle of the eye; the sac, into which these canals open; and the duct, through which the tears pass from the sac into the nose. The gland is an oblong body, about the size of a small almond, lying in a depression in the upper and outer part of the orbit. The fluid secreted by it reaches the surface of the eye by seven or eight ducts, which open on the conjunctiva at its upper and outer part. The constant motion of the upper eyelid induces a continuous gentle current of tears over the surface, which carry away any foreign particle that may have been deposited on it. The fluid then passes through two small openings, termed the *puncta lacrymalia* (see 9 in fig 6), into the canals; whence its fur-

ther course into the lower portion of the nose is sufficiently obvious from the figure. The conjunctiva (or mucous coat) which covers the front of the eyeball, and lines the inner surface of the lids, passes down and lines the canals, sac, and duct; and is thus seen to be continuous with the nasal mucous membrane, of which it may be regarded as an offshoot or digital prolongation. See MUCOUS MEMBRANES.

The *nerves* going to this organ and its appendages in the human eye, remain to be noticed.

Into each orbit there enters a nerve of *special sense* —the optic nerve, a nerve of *ordinary sensation*—the ophthalmic branch of the fifth nerve, and certain nerves of *motion* going to the muscular tissues, and regulating the movements of the various parts—viz., the third, fourth, and sixth nerves.

For the optic tracts from which the *optic nerves* originate, see BRAIN: here these nerves are merely traced from their *chiasma* or commissure forward. This commissure results from the junction of the optic tracts of the two sides; and it is especially remarkable for the fact, that it presents a partial decussation of the nervous fibres; the central fibres of each tract passing into the nerve of the *opposite* side, and crossing the corresponding fibres of the other tract, while the outermost fibres, which are much fewer in number than the central ones, pass to the optic nerve of the *same* side. In front of the commissure, the nerves enter the optic foramen at the apex of the orbit, receive a sheath or investment from the *dura mater*, acquire increased firmness, and finally terminate in the retina.

The peculiar mode of termination of the optic nerves in the cuplike expansion of the retina, the impairment or loss of vision which follows any morbid affection of them, and the constant relation in size which is observed in comparative anatomy between them and the organs of vision, afford sufficient evidence that they are the proper conductors of visual impressions to the sensorium.

The first or ophthalmic division of the fifth or trifacial nerve sends branches to the skin of the eyelids and to the conjunctiva. It is the nerve of ordinary sensation of the eye.

The most important of the nerves of motion of the eye is the third nerve, or *motor oculi*. It supplies with motor power the elevator of the upper eyelid, and all the muscles of the globe, except the superior oblique and the external straight muscle, and in addition to this, it sends filaments to the iris and other muscular fibres within the eye. The normal motor action of the nerve upon the iris, in causing contraction of the pupil, is excited through the optic nerve, and affords a good illustration of *Reflex Action* (q.v.); the stimulus of light falling upon the retina, and, through it, exciting that portion of the brain from which the third nerve

takes its origin. This nerve clearly exerts a double influence in relation to vision: (1) it mainly controls the movements of the eyeball and the upper eyelid; and (2) from its connection with the muscular structures in the interior, it regulates the amount of light that can enter the pupil, and probably takes part in the adjusting power of the eye to various distances.

The fourth nerve supplies the superior oblique muscle with motor power, while the sixth nerve similarly regulates the movements of the external straight muscle —the only two muscles in the orbit which are not supplied by the third pair.

Although not entitled to be termed a nerve of the orbit, the facial nerve deserves mention as sending a motor branch to the *orbicularis* muscle, by which the eye is closed.

2. *Comparative Anatomy of the Eye.*—In *mammals*, the structure of the eye is usually almost identical with that of man. The organ is, however, occasionally modified, to meet the peculiar wants of the animal. Thus, in the Cetacea, and in the amphibious Carnivora that catch their prey in the water, the shape of the lens is nearly spherical, as in fishes, and there is a similar thickening of the posterior part of the sclerotic, so as to thrust the retina sufficiently forward to receive the image formed by such a lens. (See the subsequent remarks on the eyes of fishes.) Again, instead of the dark-brown or black pigment which lines the human choroid, a pigment of a brilliant metallic lustre is secreted in many of the carnivory, forming the so-called *tapetum lucidum* at the bottom of the eyeball, which seems (according to Bowman) to act as a concave reflector, causing the rays of light to traverse the retina a second time, and thus probably increasing the visual power, particularly where only a feeble light is admitted to the eye. The pupil, moreover, varies in form, being transversely oblong in the Ruminants and many other Herbivora, and vertically oblong in the smaller genera of Cats. These shapes are apparently connected with the positions in which the different animals look for their food. Lastly, in some mammals (for example, the horse) there is a rudimentary third eyelid, corresponding to the *membrana nictitans* of birds.

In *birds*, the eye, though presenting the same general composition as in man, differs from the mammalian eye, in several important points. From our knowledge of the habits of birds (especially birds of prey), we should naturally expect that from their rapid movements they should be able readily to alter the focus between the extremes of long and short sighted vision, and the modifications now to be mentioned clearly have this object in view.

In reference to the figure, which represents a section of the eye of the owl, we see (1) that the shape of the

organ is not spherical, as in mammals, nor flattened anteriorly, as in fishes and aquatic reptiles, but that the cornea is very prominent, and the antero-posterior diameter lengthened; the consequence of this arrangement being to allow room for a large quantity of aqueous

Fig. 7.—Eye of Bird.

humor, and to increase the distance between the lens and the posterior part of the retina, and thus to produce a greater convergence of the rays of light, by which the animal is enabled to discern near objects, and to see with a faint light. In order to retain this elongated form, we find a series of bony plates, forming a broad zone, extending backward from the margin of the cornea, and lying embedded in the sclerotic. The edges of the pieces forming this bony zone overlap each other, and are slightly movable, and hence, when they are compressed by the action of the muscles of the ball, there is a protrusion of the aqueous humor and of the cornea, adapting the eye for near vision; while relaxation of the muscles induces a corresponding recession of the humor and flattening of the cornea, and fits the eye for distant vision. The focal distance is regulated further by a highly vascular organ called the *marsupium* or *pecten* lodged in the posterior part of the vitreous humor (fig. 7, *a*). It is attached to the optic nerve at the point where it expands into the retina, and seems endowed with a power of dilatation and contraction; as it enlarges, from distension of its blood vessels, it causes the vitreous humor to push the lens forward, while, as it collapses, the lens falls backward again toward the retina.

In addition to an upper and lower eyelid, birds have an elastic fold of conjunctiva, which, in a state of repose, lies in the inner angle of the eye, but is movable by two distinct muscles, which draw it over the cornea. It is termed the *membrana nictitans;* it is to a certain degree transparent, for (according to Cuvier), birds sometimes look through it, as, for example, the eagle when looking at the sun. The lacrymal gland is situated in mammals, but there is here a second gland,

the *glandula Harderi*, which yields a lubricating secretion.

There are no very special peculiarities in the eyes of *reptiles*, and we therefore proceed to notice the most remarkable points presented by the eye in *fishes*. From

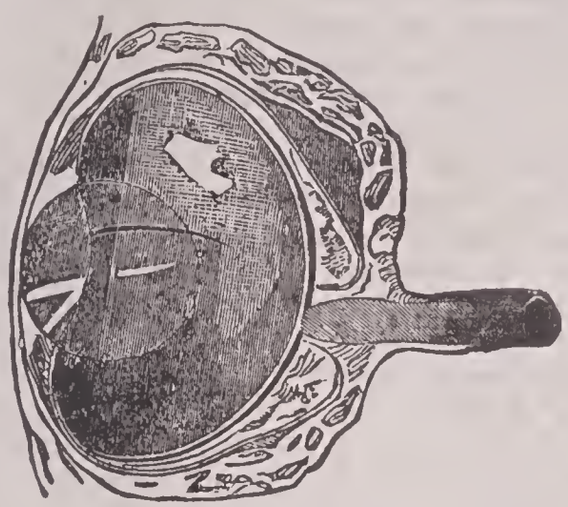


Fig. 8.—Eye of Fish.

the comparatively great density of the medium (water) through which the rays of light pass before they impinge upon the transparent structure of the eye of a fish, it is obvious that this organ must act as a very powerful refractive apparatus. The main peculiarity in the eye of the fish is the size, extreme density, and spherical shape of the lens, which give it such an extraordinary magnifying power that it has been employed as a simple microscope. But its focus being shortened in proportion as its power is increased it is necessary that the retina should be brought near its posterior surface. For this purpose, the eyeball is flattened by diminishing the quantity of vitreous humor which, being of nearly the same density as the external water, exerts no perceptible power in bringing the rays of light toward a focus; and this flattened form is maintained by the existence of two cartilaginous plates in the tissue of the sclerotic, which in some of the larger fishes is actually converted into a bony cup. The aqueous humor having here no refractive power, is barely sufficient to allow the free suspension of the iris. The pupil is very large, so as to take in as much light as possible, but is generally motionless. Their eyes being constantly washed by the water in which they live, no lacrymal apparatus is necessary, nor does any exist; and the same remark applies to the *cetacea* amongst the mammals. Thus throughout the sub-kingdom of the *vertebrata* the eye is constructed according to one general scheme, with modifications to suit the mode of life of individual classes.

In all the above cases, the structure of the eye is essentially the same; that is, there are certain dioptric media for collecting the divergent rays to their proper

focus on the retina, and there are the means of adjusting the eye for different distances. But if we examine the eyes of insects, we find that they are constructed on different principles.

In these animals, we have *simple* and *compound* eyes usually associated in the same individual. The simple eyes resemble in many respects the corresponding organs in higher animals, but the compound eyes are extremely elaborate and complex in their structure. They are two in number, appearing as hemispherical masses on the sides of the head. When examined with the microscope, their surface is seen to be divided into an enormous number of hexagonal facets, which are in fact corneæ. In the ant, there are only 50 of these facets in each eye; in the common house-fly, 4,000; in butterflies, upward of 17,000; and in some of the beetles more than 25,000. Each cornea is found to belong to a distinct eye, provided with a nervous apparatus, and exhibiting a lens, iris, and pupil. Strauss Durckheim, who has carefully studied these structures in the cockchafer, suggests that, the eyes of insects being fixed, nature has made up for their want of mobility by their number, and by turning them in all directions; so that it might be said that these little animals have a distinct eye for every object.

Compound eyes of similar structure occur in many of the crustaceans.

3. Having now described the anatomical structure of the eye in man and certain of the lower animals, we are able to proceed to the consideration of the uses of the various parts of this organ. Assuming a general knowledge of the ordinary laws of geometrical optics (see DIOPTRICS: LENS: ETC.), we will trace the course of the rays of light proceeding from any luminous body through the different media on which they impinge. If a luminous object, for example, a lighted candle, be placed at about the ordinary distance of distinct vision (about ten in.) from the front of the eye, some rays fall on the sclerotic, and being reflected, take no part in vision; the more central ones fall upon the cornea, and of these some also are reflected, giving to the surface of the eye its beautiful glistening appearance; while others pass through it, are converged by it and enter the aqueous humor, which exerts no perceptible effect on the direction. Those which fall on and pass through the outer or circumferential part of the cornea are stopped by the iris, and are either reflected or absorbed by it; while those which fall upon its more central part pass through the pupil, and are concerned in vision. In consequence of its refractive power, the rays passing through a comparatively large surface of the cornea are converged so as to pass through the relatively small pupil and impinge upon the lens, which, by the convexity of its surface, and by its greater density toward the centre, very much increases the con-

vergence of the rays passing through it. They then traverse the vitreous humor, whose principal use appears to be to afford support to the expanded retina, and are brought to a focus upon that tunic, forming there an exact but inverted image of the object.

This inversion of the image may be easily exhibited in the eye of a white rabbit or other albino animal, after removing the muscles, etc., from the back part of the globe. The flame of a candle held before the cornea may be seen inverted at the back of the eye increasing in size as the candle is brought near, diminishing as it retires, and always moving in a direction opposite to that of the flame.

The adaptation of the eye to distinct vision at every distance beyond that of a few in. is extremely remarkable, and numerous attempts have been made to explain the mechanism by which its focal length admits of alteration under the influence of the will. The theory now most generally accepted is that of Helmholtz that the accommodation is effected by a change in the form of the lens. It has been experimentally proved, that when the eye is turned from a distant to a near object, the antero-posterior diameter of the lens becomes elongated, and the anterior surface becomes more convex, while the opposite changes take place in turning the eye from a near to a distant object. According to Helmholtz, the radius of curvature of the anterior surface of the lens diminishes on turning the eye to a near object from ten to six millimetres (from about 0·4 to 0·24 of an in.), while the most projecting point of the same surface is brought forward about 0·2 of an in.

The ciliary muscle takes an active part in the process, its contraction resulting in an increase in the antero-posterior diameter of the lens with a consequent increase in its refractive power.

There are two well-known forms of defective vision in which this power of adaptation is very much limited —viz., short-sightedness or *myopia*, and long-sightedness or hypermotrophia. The limitation, however, is due not to a defect in the muscular apparatus to which we have referred, but to an abnormality either in the curves or in the density of the refracting media. In *short-sightedness* from too great a refractive power from either cause, the rays from objects at the ordinary range of distinct vision are brought too soon to a focus, so as to cross one another and begin to diverge before they fall on the retina; the eye in this case being able to bring to the proper focus on the retina only those rays which were previously diverging at a large angle from a very near object. The correction for this deficiency is accomplished by interposing between the eye and indistinctly-seen objects a *concave* lens, with a curvature just sufficient to throw the images of external objects at the ordinary distance of distinct vision backward, upon the retina. In *long-sightedness*, on the

other hand, there is an abnormal diminution of the refractive power from too flat a cornea, a deficient aqueous humor, or a flattening of the lens, so that the focus is behind the retina. This defect is corrected by *convex* lenses, which increase the convergence of the rays of light. Long-sightedness usually comes on at a comparatively advanced period of life, being then called *presbyopia*, while short-sightedness is most frequent in young persons; but both these rules present occasional exceptions; and the common belief that the latter affection naturally disappears after the middle period of life, is altogether erroneous. Another very frequent cause of indistinct vision is *astigmatism*, a condition in which the refraction is unequal, due usually to inequality of curvature of the retina, the rays of light in one meridian being deflected more than those in the other; less frequently it may be caused by an imperfect crystalline lens or by unevenness in the retina. It may be congenital or acquired, and is the most frequent cause of headaches and other reflex disturbances due to eyestrain. Its correction by glasses is necessary.

We have already noticed the most essential use of the iris—viz., its power, under the influence of light upon the retina, of modifying the size of the pupil, so as to regulate the amount of light entering the eye. But this is not its only use; one of its offices being to prevent the passage of rays through the circumferential part of the lens, and thus to obviate the indistinctness of vision which would arise from *spherical aberration* (the unequal refraction of the rays passing through the centre and near the margin of the lens), in the same manner as the diaphragms employed by the optician.

Chromatic aberration, caused by the unequal refrangibility of the primitive rays of which white light is composed, when transmitted through an ordinary lens, whereby colored fringes are produced, is *practically* corrected in the eye, though it is doubtful whether it is *entirely* absent. The provision, however, on which the achromatism depends has not been determined with certainty, probably because we do not yet know the relative refractive and dispersive powers of the cornea and humors of the eye.

4. We have hitherto been considering the eye as an optical instrument which projects pictures of external objects on the retina; we now come to the action of the nervous tunic, the *retina*, and its adaptation to the physical construction of the eye. When the retina or the optic nerve is stimulated, we have the sensation of light, whatever may be the nature of the stimulus employed—as, for example, if it be a blow on the eye in the dark, or irritation of the optic nerve from some morbid condition. The sensation of light, then, consists in a recognition by the mind of a certain condition of these nervous structures, and this condition may be induced by the application of any stimulus; the ordinary

stimulus obviously being the rays of light which fall upon the retina. There must, however, be a certain amount of light for the purpose of vision. It is difficult and painful to discern objects in a very faint light; but on the other hand, on suddenly entering from the dark into a brilliantly lighted room, everything appears confused for one or two seconds. There is, however, a gradual adaptation of the retina to different amounts of light. Persons long immured in dark dungeons acquire the power of distinctly seeing surrounding objects; while those who suddenly encounter a strong light, are unable to see distinctly until the shock which the retina has experienced has subsided, and the iris has duly contracted. In protecting the retina from the sudden effects of too strong a light, the iris is assisted by the eyelids, the orbicular muscle, and, to a certain extent, by the eyebrows. Moreover, the dark pigment of the choroid coat acts as a permanent guard to the retina, and where it is deficient, as in albinos, an ordinary light becomes painful, and the protective appendages, especially the eyelids, are in constant use.

The persistence, during a certain time, of impressions made on the retina, facilitates the exercise of sight. A momentary impression of moderate intensity continues for a fraction of a second; but if the impression be made for a considerable time, it endures for a longer period after the removal of the object. Thus, a burning stick, moved rapidly in a circle before the eyes, gives the appearance of a continuous ribbon of light, because the impression made by it at any one point of its course remains on the retina until it again reaches that point. It is owing to this property that the rapid and involuntary act of winking does not interfere with the continuous vision of surrounding objects; and, to give another illustration of its use, if we did not possess it, the act of reading would be a far more difficult performance than it now is, for we should require to keep the eye fixed on each word for a longer period, otherwise the mind would fail fully to perceive it. Again, in consequence of the retention of sensations by the retina, the image of an object may continue to be seen, especially in certain morbid states of the system, and in twilight, for some seconds after the eyes have been turned away from it, and this physiological phenomenon has probably given origin to many stories of ghosts and visions. Thus, if a person has unconsciously fixed his eyes, especially in the dusk, on a dark post or stump of a tree, he may, on looking toward the gray sky, see projected there a gigantic white image of the object, which may readily be mistaken for a supernatural appearance. These ocular spectra are always of the complementary color to that of the object. Thus, the impression left by a red spot is green; by a violet spot, yellow; and by a blue spot, orange. However

great may be the velocity of a luminous body, it can always be seen; but if an opaque body move with such rapidity as to pass through a space equal to its own diameter in a less time than that of the duration of the retinal impression, it is altogether invisible; and hence it is, for example, that we cannot see bullets, etc., in the rapid part of their flight.

A small portion of the retina, corresponding to the entrance of the optic nerve, is incapable of exciting the sensation of vision when it receives the image of an object. According to Volkmann, this small spot exactly corresponds in size with the artery lying in the centre of the optic nerve. If the 'blind spot' has been situated in the axis of the eye, a blank space would always have existed in the centre of the field of vision, since the axes of the eye in vision correspond. But as it is, the blind spots do not correspond when the eyes are directed to the same object, hence the blank which one eye would present is filled up by the other eye. Mariotte, early in the last century, first described the existence of these blind spots. Any one may satisfy himself of their existence by the following simple experiment. Let two small black circles be made upon a piece of paper, about four or five inches apart, then let the left eye be closed, and the right eye be strongly fixed upon the left-hand circle. If the paper be then moved backward and forward, a point will be found at which the right-hand circle is no longer visible, though it reappears when the paper is either brought nearer or removed further. Although no other part of the retina possesses the complete insensibility presented by the blind spot it is probable that its anterior portions have very little to do with vision. When using only one eye, we direct it toward the object we wish to inspect, in such a way as to throw the image to the back of the globe; and when the eye is thus fixed, objects near the boundary of the field of vision are less distinctly seen than those at its centre.

The extent of the field of vision for a single eye, the head being fixed, has been calculated by Dr. Young. He found that the eyeball was capable of a movement of 55 degrees in every direction, so that a single eye may have perfect vision of any point within a range of 110 degrees.

We have not yet referred to the longitudinal range, or greatest distance of human vision; indeed, this range varies so extremely that it is difficult to assign an arbitrary limit to it. Many uncivilized races, as the North American Indians, and the inhabitants of the vast Asiatic steppes, possess powers of sight which would be almost incredible if they had not been thoroughly and frequently corroborated. Our information is more definite regarding the limits of human vision in regard to the minuteness of the objects of which it can take cognizance. Ehrenberg has carefully studied this sub-

ject, and has arrived at the following results. The side of the smallest square magnitude usually visible to the naked eye—either of white particles on a black ground or conversely—is about $\frac{1}{405}$ of an inch; and with the greatest condensation of light and effort on the part of the observer, squares with a side as small as $\frac{1}{405}$ of an inch *may* be recognized, but without sharpness or certainty. Bodies smaller than these, when observed singly, cannot be discerned by the naked eye, but may be seen when placed in a row. Much smaller particles may, however, be distinctly seen, if they powerfully reflect light, thus a particle of gold-dust, which in none of its diameters exceed $\frac{1}{11123}$ of an inch, is easily discernible in common daylight. The delicacy of vision is far greater for lines than for minute areas, since opaque threads of $\frac{1}{4900}$ of an inch may be discerned when held toward the light.

For various topics, such, for instance, as 'single vision with two eyes,' 'the appreciation of solid forms by the sense of vision,' 'correct vision with an inverted image on the retina,' etc., which belong as much to metaphysics as to physiology, see VISION: also Prof. Bain's treatise on *The Senses and the Intellect.*

EYE, DISEASES OF THE.—*Conjunctivitis:* An inflammation of the mucous membrane that covers the eyeball and internal surface of the eyelids. The conjunctiva consists of three portions: the palpebral, lining the inside of the eyelids; the bulbar, covering the sclerotic; and a loose folded portion, uniting these two.

There are several forms of conjunctivitis, the discharge of each being more or less infectious. Infection takes place by the direct application of the secretion, or —it is very generally thought—through the air, in which float particles of the infecting substance. This latter mode is especially liable to occur in an ill-ventilated room, where a number of people effected with the conjunctival diseases are associated with others who possess healthy eyes, e.g., in crowded schools. Some dispute the possibility of air-borne infection, upon the ground that most of the organisms which cause the various forms of infectious conjunctivitis are non-sporing, and are readily killed by drying. The palpebral conjunctiva is often effected when the bulbar portion remains normal, and the conjunctiva of the lower lid is more frequently attacked than that of the upper lid.

Catarrhal, or Simple Acute, or Mucopurulent Conjunctivitis.—In mild cases the affection is confined to the palpebral conjunctiva, often even to the conjunctiva of the lower lid; but in the severer cases it extends to the bulbar conjunctiva. Lymph follicles and enlarged papillæ are frequently present, but not necessarily so. There is a sticky, thin, mucous, or mucopurulent secretion, which causes the eyelids to be fastened together on awakening in the morning, and sometimes produces ulceration of the edges of the eyelids.

In the severer cases there is more or less swelling, and there may be small ecchimoses in the bulbar conjunctiva, especially in certain epidemics; but these have no serious import. Minute gray infiltrations sometimes form at the margin of the cornea. When there are many of them they may become confluent and form a small gray crescent, whih ulcerates, and thus a crescentic marginal ulcer is formed, and occasionally such an ulcer is followed by iritis.

The catarrh may become chronic, and then the papillæ are more developed, while the inflammation of the lids is liable to extend over to the outer surface, causing eversion of the lower opening of the tear duct with resulting lacrymation, and this, in its turn, aggravates the conjunctival affection. The subjective symptoms are a sensation of sand in the eye, with heat and burning, and a feeling of weight on the eyelid. Sensitiveness to light is not generally severe unless there be some corneal complication.

The outcome is usually favorable except when the mild form is but the commencement of a more severe inflammation. The infiltrations and even the ulcers which sometimes form at the margin of the cornea are not often of serious import, and usually heal according as the treatment restores the conjunctiva to health.

Treatment consists in the application of cold or iced compresses with an antiseptic lotion; this should be used at the first onset, and in mild cases will alone bring about a cure. But the habit, which some patients so readily acquire, of bathing the eyes frequently with cold water should not be permitted, for it is deterious to the conjunctival affection. Useful applications are a saturated solution of boracic acid, or a solution of zinc sulphate, one grain to an ounce of water, one drop in the eye three times a day. A weak boracic ointment, may be applied along the margins of the lids at bedtime. It prevents the gumminess in the morning, which is not only unpleasant to the patient, but is also injurious, by fastening the eyelids together, and thus preventing free drainage of the secretion during the night.

Purulent Ophthalmia.—We most commonly find this very dangerous affection either as gonorrheal ophthalmia or as purulent ophthalmia of the newborn. Inoculation may also occur a few days after birth by pus conveyed by the fingers of the mother or nurse, or by towels, etc., used for washing the child's face. It is never due to exposure to strong light or to cold, as is popularly supposed. The more severe cases of blennorrhea neonatorum are caused by a gonorrheal vaginal discharge, but mild cases may be caused by a vaginal discharge, which is not of specific gonorrheal nature. If the infection take place during or immediately after birth, the disease appears from the second to the fifth day, according to the virulence of the secretion. If

the inflammation come on later than the fifth day, it may be concluded that the infection was produced by the vaginal discharge being introduced into the eye by the fingers of the mother or nurse. Acute conjunctival blennorrhea also comes about without any assignable cause; but in all such cases it may be regarded as certain that the introduction of some infective pus into the eye has taken place, although without the knowledge of the patient.

In mild cases the bulbar conjunctiva may be alone affected without swelling of the eyelids. In severe cases there is, soon after the onset, serious infiltration of the papillæ, the palpebral conjunctiva becomes less becomes tense and shiny, and also of the bulbar conjunctiva, discharge, dusky redness and swelling of the eyelids, which make it difficult to avert them, pain in the eyelids, often of a shooting kind, burning sensation in the eye, and sensitiveness to light. This first stage lasts from 48 hours to four or five days. Then begins the second stage, in which, owing to swelling of the palpillæ, the palpebral conjunctiva becomes less shiny and more velvety; the discharge alters from serous to characteristic purulent form; the swelling of the conjunctiva of the eyeball, however, remains unaltered, or becomes more firm and fleshy.

Corneal complications form the great source of danger from this affection. They occur in four different forms: (1) Small abrasions of the epithlium on any part of the cornea. If these occur at the height of the inflammation, they are apt to go on to form deep perforating purulent ulcers. (2) The whole cornea becomes opaque (diffusely infiltrated), and toward its center some grayish spots form, which are interstitial abscesses or purulent infiltrations. (3) The infiltration may form at the margin of the cornea, and extend a considerable distance around its circumference, giving rise to a ring-shaped ulcer, and, later on, to sloughing of the whole cornea. (4) A clean-cut ulcer may form at the margin of the cornea without any purulent infiltration of the corneal tissue, and may also extend a long way round the cornea. Such ulcers are particularly apt to occur where there is much swelling which overlaps the margin of the cornea; and, being hidden in this way, these ulcers are easily overlooked. The danger of these ulcers consists in the perforation of the cornea they are apt to produce.

The prevention of purulent ophthalmia is a most important matter. Careful disinfection before and during birth, and the most minute care in cleansing the face and eyes of the infant immediately after birth with a non-irritating disinfectant, are to be recommended. The method of the late Dr. Credé has found very general acceptance, and is an admirable one. It is as follows: When, the child is in the bath, the eyes are carefully washed with water from a separate

vessel, the lids being scrupulously freed, by means of absorbent wool, of all blood and mucus. Then, before the child is dressed, a few drops of a 2 per cent. solution of nitrate of silver are instilled into the eye. Many obstetricians employ this method now as a matter of routine for all newborn infants, whether or not infection is suspected. By its aid Credé reduced the percentage of his cases of ophthalmia neonatorum from 8 or 9 per cent. to 0.5 per cent.

In the very commencement of the affection the only local applications admissible are antiseptic lotions, such as permanganate of potassium solution, 1 in 10,000; or bichloride of mercury, 1 in 5,000, and iced compresses. The conjunctival sac should be freely washed or irrigated, not syringed out with one of these solutions; in syringing out the conjunctival sac a morsel of the corneal epithelium may be removed and through this the cornea may become infected. The iced compresses should be kept to the eye for an hour at a time, with a pause of an hour, or even continuously.

When the conjunctiva has become velvety, and the discharge purulent, caustic applications are the best.

When but one eye is affected it is important to protect its fellow by means of a bandage. This may be made by applying to the eye a piece of lint covered with boracic-acid ointment, and over this a pad of borated cotton-wool; across this, from forehead to cheek and from nose to temporal region, are laid strips of lint, soaked in collodion, in layers over each other.

Follicular conjunctivitis is a catarrhal conjunctivitis, to which is added the presence in the conjunctiva of small round pinkish bodies the size of a pin's head. These disappear completely as the inflammation passes off, leaving the mucous membrane as healthy as before. These little bodies are situated chiefly in the lower fold of the conjunctiva, and may be discovered by eversion of the lower lid, when they will be seen arranged in rows parallel to the margin of the lid. Whether they are easily discovered or not depends on their size and number and on the amount of coexisting hyperemia and swelling of the conjunctiva. The structure of these bodies shows them to be lymph follicles. Follicular conjunctivitis is a very tedious affection, lasting often for months. It is more apt to give rise to marginal ulceration of the cornea than the simple catarrhal form.

The symptoms are much the same as those of catarrhal conjunctivitis. Frequently there is little or no injection of the bulbar conjunctiva, and the chief symptom is an inability to continue near work (reading or sewing) for any length of time, and much distress from artificial light. Boys and girls from 5 to 15 years of age are those most liable to this affection.

The causes are much the same as in simple catarrhal conjunctivitis.

Spring catarrh.—The conjunctiva is invaded by hard flattened bodies of a pinkish color arranged close together. The conjunctiva assumes a milky opacity. The conjunctiva of the eyeball becomes injected and slightly swollen. All these appearances may be present in the same case, or any one or two of them may be absent. The margin of the cornea itself is apt to be invaded with minute infiltrations. There is some mucous or mucopurulent secretion, and the patient complains of the eyelids being stuck together in the morning, of difficulty of using the eyes for near work, of itching or burning sensations, and all these symptoms are increased by exposure to heat. The eyelids droop slightly, giving the patient a sleepy look. The affection makes its appearance with the advent of warm weather in the late spring or early summer, and generally disappears, or is much modified, in the cool seasons, to return again with the next warm season; and this is liable to go on for a long series of years.

The treatment of the majority of these cases yields very unsatisfactory results. Protection glasses should be worn. So far as possible all exposure to great heat of the sun or to artificial heat should be avoided. Weak astringent eye washes or ointments may be used.

Trachoma, *granular conjunctivitis, or granular ophthalmia, or granular lids* (also called Egyptian ophthalmia and military ophthalmia).—In this disease, in addition to the usual appearances of simple conjunctivitis, there are developed grayish or pinkish gray bodies, about the size of the head of a pin, situated on the conjunctiva, chiefly of the upper lid, but also disseminated over other parts of the membrane, except that they do not form on the bulbar conjunctiva. These bodies or granulations, or so-called 'sago' grains, consist at first of lymph corpuscles alone; but at a later period this is true only of the superficial portion, while at their bases they are formed chiefly of connective tissue. They are to be regarded as new growths in the conjunctiva. In addition to the true trachoma bodies, a luxuriant papillary growth often springs up in the chronic cases. No specific microorganism has as yet been discovered as the cause of trachoma.

The disease may be acute or chronic. The latter may result from the former, but it is much more common to find it as the primary condition, without any appreciable acute stage having gone before. Both forms are contagious, and probably the infection occurs only by transference of the secretion from one eye to the other by means of fingers, towels, handkerchiefs, etc. Hence the more slovenly in their personal habits, and the more crowded in their dwellings, people may be, the more likely is this disease to spread from one individual to another when it once gains a foothold.

Acute trachoma is an affection frequently seen in this country. An attack commences with swelling of

the papillæ and development of the characteristic trachoma bodies. There may be but little discharge: but there is generally much lacrymation with photophobia, and great pain in the brow and eye. Superficial ulcers of the cornea may form. The inflammation and papillary swelling increase for a week or so to such a degree that the granulations are hidden from view; and then taking on a purulent form, the process gradually subsides, until in the course of two or three weeks longer, the discharge ceases, having brought about absorption of the trachoma bodies, and ultimately the mucous membrane is left in a healthy state. If, however, in the purulent stage, the inflammation is excessive, the eye may run all the dangers of an attack of acute purulent conjunctivitis; or if, on the other hand, the inflammation is very slight, it may not be sufficient to effect absorption of the granulations, and the process may run into the chronic form. Egyptian ophthalmia, which is an acute form of trachoma, seems to be a combination of trachomatous disease with purulent ophthalmia, as the gonococcus can be found in the discharge.

It is desirable to abstain from active measures of treatment in the commencement of the affection, owing to the tendency to natural cure which is often present; and especially astringents and caustics should be avoided. At the utmost an antiseptic lotion and cold applications for relief of the pain and heat are admissible. Dark protection-glasses are agreeable, and, wearing them, the patient should be encouraged to take open-air exercise.

Chronic Trachoma.—When the onset of this disease is without inflammation, there are no distressing symptoms, except that the eye may be more easily irritated by exposure to cold winds, foreign bodies, etc., or more easily wearied by reading and other near work. At this period the conjunctiva will be found free from injection or swelling; but grayish-white semi-transparent trachoma bodies, of the size of a grape-seed and less, will be seen scattered over the conjunctival surface and protruding from it. Gradually these granulations excite a more or less active vascular reaction, attended with swelling and purulent discharge. The patients then begin to be more inconvenienced, owing to the discharge which obscures their vision, to sensations of weight in the lids and of foreign bodies in the eye, and to partial dropping of the upper lid, which is often observable; and this, consequently, is generally the earliest stage at which we see the disease. The enlarged papillæ often grow to a great size, completely hiding the granulations. In this stage the granulations may become absorbed, and the disease undergo cure; but more commonly it makes further progress. Fresh granulations appear, while the old ones increase in size and undergo a peculiar gelatinous change. They

then often become confluent, leaving only here and there an island of healthy mucous membrane. Sometimes the trachoma bodies are very small, and present the appearances of minute white dots, and in this form they are not always easily found.

As the disease advances the submucous tissue becomes implicated in the connective-tissue alterations; the granulations disappear, having reduced the conjunctiva more or less to a scar; contraction of the diseased conjunctiva on the inner surface of the lid causes the lids to turn in, followed by irregular growth of the eyelashes, with resulting distress.

The great danger of granular ophthalmia lies in the complications which may attend it or which follow in its wake; the former consist in pannus, ulcers of the cornea, and severe purulent conjunctivitis, while the latter are the distortions of the lids and eyelashes just referred to.

Pannus presents the appearance of a superficial congestion of the cornea, with more or less diffuse opacity, and often small infiltrations. It invariably commences in the upper portion of the cornea, extending generally over the upper half, and frequently remains confined to this region. But in many cases, at a latter stage, it extends to the whole surface of the cornea; and this latter occurrence often takes place almost suddenly; then the vascularization and opacity sometimes become so intense as to present quite a fleshy appearance, completely hiding the corresponding part of the iris from view. Pannus is usually a painless affection, but is sometimes accompanied by sensitiveness to light and pain in the eye. It may come on at any stage of the disease, and causes defective vision in proportion to the degree and extent of the opacity. Severe pannus is liable to induce iritis.

If trachoma comes under care at an early period, and if treatment is carried out strictly, vision will be retained in a majority of cases, although a radical cure may be difficult or impossible. These cases require to be under constant treatment for long periods, and the very length of time and the steady continuous treatment needed for a cure are probably the main obstacles to that cure. The common experience of oculists is that patients attend for some weeks, and then, being very considerably relieved of their distressing symptoms, and finding their sight vastly improved, they cease attrachoma bodies with the greatest possible dispatch, return after a brief interval with a condition of things as bad, if not worse, than before. It is therefore desirable at the very outset of treatment to remember the tedious and dangerous nature of the ailment. The aim of treatment is to bring about absorption of the trachoma bodies with the greatest possible dispatch, in order to prevent the destruction of the mucous membrane to which they tend. No caustic application

should be made with the object of directly destroying the trachoma bodies, for this can only be done at the expense of the mucous membrane around them. The treatment can only be carried out by the ophthalmologist, and in unskilled hands might do more harm than good.

Lymphoma of the Conjunctiva.—Under this heading cases have been described which present the appearances, at first sight, of acute granular ophthalmia; but the 'granulations,' which are enormous in size, attack both lids, and are associated with enlarged glandular masses in the neck, which do not lead to ulceration or scarring. The conjunctival affection runs a rapid and favorable course, without any cicatricial contraction.

Croupous Conjunctivitis.—This is a disease of early childhood, and is not common. The palpebral conjunctiva is a good deal swollen, and is covered with a false membrane, that may be peeled off, leaving a mucous surface underneath, which bleeds little or not at all. The disease is not a severe one, and does not cause secondary corneal affections, unless when the bulbar conjunctiva, as it very rarely does, participates in the attack. It must not be mistaken for diphtheritic conjunctivitis, from which it is readily distinguished by the ease with which in it the false membrane can be removed, and by the vascular condition of the underlying mucous membrane. This is usually regarded as nothing more than a severe form of catarrhal conjunctivitis, in which the secretion happens to be rich in fibrin, and hence possessed of a marked tendency to coagulate on the surface of the conjunctiva. But the presence of the diphtheria bacillus has been demonstrated in cases of croupous conjunctivitis, which ran a favorable course, and hence there seems to be a bacteriological relationship between this form of conjunctivitis and diphtheritic conjunctivitis, which are so different from each other clinically.

Diphtheritic Conjunctivitis.—There is no more serious ocular disease than this, for it may destroy the eye in twenty-four hours; while in severe cases treatment is almost powerless. Fortunately it is almost unknown in this country.

The symptoms of its initial stage are similar, although severer, especially in the matter of pain, to those of purulent conjunctiva, in that the lids are excessively stiff, owing to infiltration of the deeper layers of the conjunctiva, while the surface of the mucous membrane is smooth, and of a grayish pale buff color. If an attempt be made to peel off some of the superficial exudation the surface underneath will be found the same gray color, not red and vascular, as in croupous conjunctivitis. This stage of infiltration lasts from six to ten days, and constitutes the period of greatest peril to the eye; for while it lasts the nutrition of the cornea must suffer, and sloughing of that part

is extremely apt to take place. Towards the close of the first stage the fibrinous infiltration is eliminated from the eyelids, and the conjunctiva gradually assumes a red and succulent appearance, and at the same time a purulent discharge is established. This constitutes the second or purulent stage. A third stage is formed by scar changes in the mucous membrane, which often lead to adhesions between the lid and the eye or to a permanent thickening of the conjunctiva: so that even if the eye escape corneal dangers in the first and second stages, others almost as serious may await it in the final stage. Corneal complications are most likely to occur in the first stage, and are then also most likely to prove destructive to the eye. The earlier they appear the more dangerous they are. If the purulent stage come on before corneal complications appear, or even before an ulcer contracted in the first stage has advanced far, they are more easily controlled.

It is difficult to assign a cause for this disease, which chiefly attacks children. It is frequently epidemic, is extremely infectious, and, although similar in its nature, is rarely, if ever, found in connection with an attack of diphtheria of the throat. The diphtheria bacillus is always present in the conjunctival discharge. Injection of antitoxin is the sovereign remedy, but local applications are also of use. In the first stage frequent warm fomentations, with antiseptic cleansing, are the only local measures admissible. No caustic or astringent application should be used. Internally, the patient should be treated with iron and quinine and generous diet. In the second or purulent stage careful caustic applications are to be used. Corneal ulcers must be dealt with, whenever they arise, in the same way as though the case were one of blennorrheic conjunctivitis.

Tuberculous disease of the conjunctiva is an extremely rare disease. It usually commences on the palpebral conjunctiva, of the upper lid, and very rarely on the bulbar conjunctiva, in the form of small round yellowish-gray nodules, which soon ulcerate. The margins of these ulcers are well defined, and their floors are of a yellowish appearance, or covered with grayish-red granulations. The surrounding conjunctiva is swollen, and if the palpebral conjunctiva is much involved the lid becomes enlarged and the ulcerative process may soon destroy part of it. The inflammation may also extend to the bulbar conjunctiva, and the cornea may become covered with pannus. The preauricular and submaxillary glands usually become enlarged. The positive diagnosis of the nature of the disease can be made by the examination of scrapings from the floor of the ulcer for the characteristic tubercle bacillus. The disease is very chronic, its progress sometimes extending over many years. Some of those whose eyes are attacked are already the subjects

of tuberculosis in other organs, but very many of them are perfectly healthy in that respect.

Pemphigus of the Conjunctiva.—This is another rare disease. It has been seen in connection with pemphigus vulgaris of other parts of the body, but it also occurs as an independent disease.

Subconjunctival Hemorrhage.—The rupture of a small subconjunctival vessel in the bulbar conjunctiva, without conjunctivitis, is of frequent occurrence. It suddenly gives a more or less extensive purple hue to the 'white of the eye,' causing the patient much concern. It is common enough in old people, but may occur in the young, and even in children, from severe straining, as in whopping-cough, vomiting, or raising heavy weights. It is occasionally significant of diabetes. It also occurs sometimes during epileptic fits, and profuse subconjunctival hemorrhage is occasionally found in cases of fracture of the base of the skull, having made its way along the floor of the orbit. It is of no importance so far as the integrity of the eye is concerned.

Its treatment is required, the extravasated blood gradually becoming absorbed.

Injuries of the Conjunctiva.—Foreign bodies frequently make their way into the conjunctival sac, and cause much pain, especially if they get under the upper lid. If the foreign body is under the lower lid it will be easily found on drawing down the latter, and, provided it is not actually embedded in the mucous membrane, it is easily removed with a camel's-hair pencil or with the corner of a soft pocket-handkerchief; but if the cinder or other body is under the upper lid it is necessary to evert the latter before it is reached.

The conjunctiva is frequently injured in severe wounds of the eyelids or eyeball. The treatment is directed here chiefly to the more important parts which have been injured. A tear or wound of the conjunctiva (usually of the bulbar portion), when it occasionally occurs without injury to other parts, is in general of very slight moment. If the wound is extensive its edges should be drawn together with a suture; but otherwise healing will take place with the aid of a simple bandage to keep the eye closed for a few days.

A common form of injury, which may involve the conjunctiva alone, is burn by acid or lime. In the case of a strong acid getting into the eye, if the patient is seen immediately after the occurrence, the whole conjunctival sac should be well washed out with an alkaline solution (1 per cent. soda solution). In the case of lime, after all the particles have been most carefully removed from the eye with forceps, a weak solution of a mineral acid may be used for washing out the conjunctival sac; or a solution of sugar as thick as syrup may be poured into the eye. Later, olive or castor oil, or even butter, may be applied, the subsequent treatment being continued with weak sublimate ointment.

In the case of a severe burn of the conjunctiva, the resulting scar is liable to produce a more or less extensive union of the eyelid to the eyeball (symblepharon), which often interferes with the motion of the latter, and with vision, if the cornea is obscured. No measure taken during the healing process can prevent symblepharon if the degree of the burn is such as to bring it about. Picric acid, 4 grains to an ounce of water, will relieve the pain from a burn, but a surgeon should be consulted without delay.

Cases of iritis in which there is no pain are usually due to rheumatism. Lacrymation and photophobia are occasionally present, but never to such a degree as is often observed in some corneal affections. The tension of the eye in iritis is usually normal, but in some violent cases it will be found to be high, as also in some cases where, while the inflammatory symptoms are but slight, the punctate corneal deposits are marked, and in cases, too, where the angle of the anterior chamber is blocked.

Hemorrhagic iritis is not a special form of iritis, but is merely a severe inflammation of the iritis with extravasation of blood. It is chiefly seen in iritis due to operations and injuries, in some cases of sympathetic iritis, and in old people.

Iritis is not common in children, except as complicat- circumscribed tumors or small warts of a yellowish color, the rest of the iris being apparently intact. These tumors vary in size from that of a hemp-seed to that of a small pea, and are situated usually at the pupillary margin, occasionally at the periphery of the iris, and very rarely in the body of the iris. There may be but one tumor present, and there are seldom more than three or four.

The duration of an attack of iritis cannot be foretold at the outset. Cases which are in other respects mild, i.e., those in which the pupil dilates well and rapidly to atropine, the aqueous humor is clear, and but little lymph is thrown out, often continue for weeks irritable and painful.

Iritis is not common in children, except as complicating a corneal process, or as a result of congenital syphilis or tuberculosis. Towards puberty slight iritis is sometimes found in girls. Youth and middle age are the times of life in which iritis is most often seen, while in old age it again becomes rare. More than 50 per cent. of the cases depend on syphilis, and a large proportion of the remainder are due to rheumatism. During desquamation after smallpox iritis is sometimes observed. In puerperal fever and septicemia purulent iritis occurs, as also in typhoid fever, pneumonia, and recurrent fever. Diabetes sometimes causes iritis.

Atropine, either in distilled water, 1 per cent. strength, or in a salve (vaselin) of the same strength is the best agent. Great care must be taken as some

individuals are peculiarly susceptible to atropine poisoning.

Keratitis (inflammation of the cornea).—There are many forms of keratitis.

Interstitial, or Parenchymatous, Keratitis.—This affection occurs most commonly between the ages of five and fifteen. It usually commences at some one part of the margin as a light grayish opacity, accompanied by slight injection of the blood vessels. The rest of the corneal margin soon becomes similarly affected, and then gradually the opacity extends concentrically into the cornea, or does so by sending in processes which afterwards become confluent. In this way the whole cornea becomes affected by degrees; and its epithelium acquires a ground-glass appearance. Occasionally the opacity commences at the center, and not at the margin of the cornea, as small gray spots, and extends towards the margin, which it often does not reach before clearing commences. The opacity lies in the deep layers of cornea, and is slightly more intense in spots here and there. It is sometimes only a very light cloud, while again the cornea may be so opaque as to render the iris quite invisible. Along with the opacity, vessels form in the cornea in its posterior layers, but the degree of vascularization varies very much in different cases.

In severe cases iritis and choroiditis are nearly always present, although the latter is not observable until the cornea has become clear enough to admit of an ophthalmoscopic examination. The affection is often accompanied by severe pain. The acute stage of the disease lasts from six to eight weeks, or longer. But the entire process may not be complete for many months. Both eyes almost invariably become affected in children, although not always at the same time, the second eye being often not attacked until the inflammation in the first has made some progress, or, perhaps, not until it has undergone cure. It is important, in the very commencement of treatment, to acquaint the patient or parents with the likelihood of this course of events. In adults usually one eye alone is attacked, iritis is rare, the duration of the process is comparatively short, and complete clearing up is relatively frequent.

The affection is more common in girls than in boys, and most frequently appears during the second dentition. It is due in over 50 per cent. of the cases, to inherited syphilis. The children are often thin, anemic, and of stunted growth, with flat nose, scarring at the angles of the mouth, often more or less deaf; and a peculiar notching of the incisor teeth is present in about one-half of the cases. Occurring in adults, the affection is rarely due to inherited syphilis, although acquired lues may sometimes be taken as its cause; while, again, it will often be impossible to assign any origin for it

other than the universal one of exposure to cold, etc. Possibly some cases are due to tuberculosis.

In children the result of the disease is doubtful, in view of the possibility of an incomplete clearing of the cornea and the irregularity of its surface which the process may cause, as well as of the serious complications liable to supervene which may completely destroy the sight. Yet in the milder cases a cure may result. In adults the prognosis is much more favorable.

In the early stages no irritants should be locally applied. Atropine is important for the prevention of the iritis or of adhesions; and the use of hot poultices or fomentations promotes the nutrition of the cornea and hastens the cure by absorption of the cellular elements which form the opacity. A shade should be worn. When the acute stage is ended the yellow oxide of mercury ointment may be employed with benefit for stimulating the absorbents to carry off what remains of the opacity. Massage may be used with advantage in both stages to disperse the infiltration. In severe cases a course of mercurial inunctions, continued for several weeks, may be needed. In mild cases a tonic plan of treatment, with iodide of iron and cod-liver oil, is the most suitable.

Keratitis Profunda.—This also is an interstitial or parenchymatous keratitis. It presents the appearance of a grayish opacity in the deep layers of the cornea at or near its centre, which gradually increases in intensity and extent, but never reaches the margin of the cornea. The epithelium of the cornea over the infiltration is dull. There is but little vascularization and no great tendency to inflammation of the uveal tract. After some weeks the infiltration gradually breaks up and becomes absorbed, leaving in severe cases a good deal of opacity, and in less severe cases a fairly clear cornea. The affection is seen only in adults, and its etiology is unknown. The treatment consists in the use of atropine, with care of the general health.

Keratitis Punctata begins with the symptoms of an acute conjunctivitis. Either at the same time, or some days or weeks afterwards, minute gray spots may be seen in the superficial layers of the cornea, the epithelium over the spots being somewhat raised up. The spots are often arranged in groups or rows, and may be scattered over nearly the entire cornea, or else confined to its central region. There may be but a few of them, or there may a hundred or more, and one or both eyes may be affected. The initial irritative symptoms soon disappear; but the spots themselves remain for many weeks, or longer, and finally fade away entirely. It is more common in young people than in later life, and occurs usually in connection with nasal or bronchial catarrh, but it must not be counfounded with herpes of the cornea. The spots are often very faint, and hence may easily be overlooked, unless

searched for with the opaque light. The affection is rare. The treatment consists in the use of atropine and heat.

Riband-like Keratitis (Transverse Calcareous Film of the Cornea).—This is a degenerative alteration which occurs chiefly in the cornea of the eyes destroyed by severe intraocular processes, such as iridocyclitis, sympathetic ophthalmitis, glaucoma, etc. It also occasionally occurs as a primary disease in some persons of advanced life. In these latter instances glaucoma often comes on at a later period, or the corneal disease may be followed by iridocyclitis, or central choroiditis. It seems probable that in these primary cases the cause of the degeneration is simply a loss of vital energy in the corneal tissue, due, it may be, to vascular changes—in many instances to gout. It usually commences on the inner margin of the cornea, but soon appears at the outer margin, and advances from each direction toward the center, where the two sections join. It presents the appearance of a grayish-brown opacity, with, in most cases, white calcareous deposits in and under the epithelium. The opaque masses consist of carbonate and phosphate of lime. As regards treatment, some improvement may be affected by scraping away the chalky deposit.

Glaucoma.—The name was given to the disease by the old writers, on account of the greenish reflection obtained from the pupil in some cases. But this greenish reflection is seen in other diseased conditions, and therefore is not characteristic of glaucoma. The chief essential symptoms of this disease is increased hardness of the eyeball, due to overfullness of the globe.

Glaucoma may be primary or secondary. In primary glaucoma, the increased tension comes on without any previous recognizable disease of the eye; in secondary glaucoma, the increased tension comes on in consequence of obvious antecedent disease in the eye.

Primary Glaucoma is almost invariably a binocular disease, although it does not always attack each eye simultaneously, indeed it is more common for the disease to appear in the eyes with an interval of months or longer.

Of primary glaucoma there are two great kinds—non-inflammatory, non-congestive, or chronic Glaucoma; and inflammatory, congestive, or more or less acute Glaucoma.

If we place the tips of the index fingers close together on a normal eyeball, and make gentle pressure with them alternately, we will observe that the eyeball pits slightly on this pressure, and that a sensation of fluctuation is given to the fingers. The amount of this pitting or fluctuation varies according to the degree to which the eyeball is filled with its humors, and also, to some extent, according to the thickness of the sclerotic coat, and is not precisely the same in every normal eye.

The glaucomatous eyeball is felt to be more resistant—to be harder—than the normal globe.

Chronic, or *Non-Inflammatory, Glaucoma* (also known as simple and as chronic non-congestive glaucoma).—The tension is more or less increased. The external appearance of the eye is usually quite normal, and the pupil reacts well to light. The anterior chamber is sometimes a little shallow. On examination with the ophthalmoscope the optic papilla is found to be cupped. This cupping is a most important sign of glaucoma, and differs essentially in appearance from the physiological cupping, inasmuch as it occupies the entire area of the papilla, and has a steep, not shelving side. The acuteness of the central vision is diminished, and increasing dimness of sight is the only symptom of which the patient complains in chronic simple glaucoma.

The progress of the disease is extremely slow and insidious, extending often over several years, and ends in total blindness if untreated. It usually attacks both eyes, but generally one of them long before its fellow. Sometimes chronic simple glaucoma after a time, takes on the acute or the subacute form.

In Acute or *Inflammatory Glaucoma* (also called acute congestive glaucoma) the increase of tension is always very marked. In addition to this there are the following symptoms: Diminished depth of the interior chamber, from pushing forwards of the lens and iris; diminution of the refracting power of the eye, by reason of the nearer approach of the latter to a globular shape; diminution of the amplitude of accommodation, and anesthesia of the cornea, owing to pressure on the ciliary nerves as they pass along the inner surface of the sclerotic; opacity of the cornea, giving its surface a peculiar steamy appearance, due to edema of the corneal tissue and epithelium, by infiltration to them of the intraocular fluids from high tension; indistinctness of the pattern of the iris, similarly due to edema; opacity of the aqueous and vitreous humors; dilatation and immobility of the pupil, the result, according to some, of paralysis of the ciliary nerves, but, according to others, of anemia of the iris from pressure on its vessels. The pupil is oval, with its long axis verticle. The episcleral veins are large and tortuous.

Subjective appearance of light and color, and colored halos or rainbows around lamps and candles (iridescent vision), are complained of. Similar appearances are sometimes experienced by persons suffering from chronic conjunctivitis. Pain is a very marked symptom of acute glaucoma, both in the eye, and radiating over the corresponding side of the head. This pain is often very violent. Vision is greatly affected, and the field of vision will be found contracted, in cases of some standing.

In acute glaucoma we recognize certain premonitory symptoms, viz., sudden diminution of the amplitude of accommodation, evidenced by rapid onset or increase of

presbyopia, and the consequent necessity for glasses for near work; and the occasional appearance of colored halos around the flames of lamps or candles, with attacks of fogginess of the general vision. The duration of one of these foggy attacks may be from a few minutes to several hours. Such attacks are apt to occur after a sleepless night, or after a meal, and are sometimes accompanied by periorbital pains. Slight opacity of the aqueous humor, and sluggishness of the pupil, with some dilatation, are present during an attack; but the eye afterwards returns to its normal condition, and remains so for weeks or months, until another similar attack comes on. Such a premonitory stage may last a year or longer, but cases also occur in which there is no premonitory stage.

The onset of the *true glaucoma attack* is usually at night. It is accompanied by violent pain radiating through the head from the eye, by pericorneal injection, chemosis, and lacrymation. The aqueous humor is cloudy, the anterior chamber shallow, the iris discolored, and the pupil dilated to medium size and of oval shape, the cornea steamy and anesthetic. The patient frequently complains of light, and vision is very defective, or may be quite wanting. Vomiting very frequently accompanies acute glaucoma, and has often led to errors of diagnosis, the patient's ailment having been taken to be a gastric disease while the ocular symptoms were regarded as mere coincidences, such as a cold in the eye, neuralgia, etc. An attack like that just described may, to a great extent, pass away in the course of a few days, but the complete disappearance of all the symptoms does not take place. Another acute attack of glaucoma comes on in the course of some weeks or months, but it may pass away leaving the eye in a still worse condition than it found. The attacks gradually become more frequent, and if in the intervals the eye is examined the cornea and vitreous humor will be found more or less opaque, the optic papilla cupped, and an arterial pulsation may be discovered. Finally, there is no remission from the attack, the violent glaucoma-symptoms become permanent, and all vision is forever destroyed.

Glaucoma Fulminans is the name given by von Graefe to a form of the disease which is more acute than the ordinary acute glaucoma just described. It has no premonitory stage, and, coming on with all the symptoms of acute glaucoma greatly exaggerated, causes complete permanent destruction of vision in the course of a few hours. It is a rare form.

Subacute Glaucoma differs from acute glaucoma in that its premonitory stage merges gradually into the actual disease without the occurrence of an acute attack. The eye gradually becomes hard, the pupil dilated, the anterior chamber shallow, the aqueous humor opaque; while the cornea is 'steamy,' and anesthetic,

and the episcleral veins are distended. Ophthalmoscopically the cupped disc and pulsating arteries may be seen, when the opacities of the media permit. Vision sinks, and the field is contracted towards its nasal side. The progress of the disease is very slow; and in its course attacks of ciliary neuralgia, with greater increase of the tension, greater opacity of the aqueous humor, increase of the corneal opacity and anesthesia, and further dimness of vision, are experienced. These attacks pass off again in the course of a few days or hours, leaving the eye harder and blinder than before. The subacute glaucoma sometimes takes on the acute form. It is liable to bring about the same glaucomatous degeneration of the eye as does the latter.

Glaucoma is a disease of advanced life, occurring most usually after fifty years of age, and rarely under the thirtieth year. It is not peculiar, or more common to any one constitution or temperament. Anxiety, sorrow, and influences in general which depress the spirits have often been noticed to precede the onset of acute glaucoma.

The performance of an iridectomy is the means discovered by von Graefe in the year 1857, for the cure of glaucoma, a disease which had hitherto been incurable. Myotics are also employed in the treatment. They reduce tension by causing contraction of the pupil, and consequent drawing away of the base of the iris from the angle of the anterior chamber. The myotic treatment rarely produces a radical cure, and it should only be used to preserve the health of the eye, until the operation is performed.

Hemorrhagic Glaucoma.—Retinal hemorrhages of the ordinary type are sometimes followed, a few weeks later, by increased intraocular tension, which generally assumes the symptoms of acute or subacute glaucoma, and, more rarely, those of chronic simple glaucoma. The disease is practically hopeless.

Foreign Bodies in the Cornea, such as bits of iron, stone, coal, etc., are amongst the most common accidents of the entire body. The pain caused by these foreign bodies is very considerable, as can be understood, when the rich nerve supply of the cornea is remembered.

The dangers which may follow on the presence of a foreign body in the cornea depend partly upon the infection or non-infection of the foreign body, and partly upon the depth at which it is buried in the cornea. The deeper a foreign body lies the more difficult will be its removal, and the greater must be the laceration of the cornea caused by its removal. A foreign body lying quite superficially in the epithelium is easily removed by gentle wiping with a clean camel's-hair pencil, or soft cloth. Those which lie deeper require instrumental interference.

Abrasions of the surface of the cornea are very common from rubs or scratches with branches of trees,

finger-nails, etc. These injuries heal rapidly by protecting the eye with a bandage; but when neglected, or if septic matter have been introduced when the injury occurred, or if it be present in the conjunctiva or the lacrymal sac, these losses of substances are capable of forming the starting-point of corneal abscess, etc.

Blows on the Eye are liable to cause corneal bullæ. These may also form after burns with lime, etc. Another condition caused by blows on the eye is hemorrhagic discoloration of the true cornea, which presents a greenish or a reddish-brown color in the cornea.

Burns of the cornea from lime are not uncommon. The lime acts as a caustic, and destroys the cornea more or less deeply, with resulting more or less intense permanent cicatrical opacity. The lime, moreover, enters into chemical combination with the corneal tissues in the form of the albuminate of lime, which causes further opacity. As soon as possible after lime has entered the eye it should be removed as thoroughly as possible by free washing out with water; or, better still, with saturated solution of sugar, which forms, with whatever loose lime may be present, an insoluble substance that may be readily removed.

Perforating Injuries of the Cornea.—In these cases the injury done is rarely to the cornea alone, and at the first inspection the attention of the surgeon is occupied less with the state of the cornea than with the question as to whether, and to what extent, deeper parts of the eye are involved. Another very important point which has often to be decided is whether or not the foreign body which has perforated the cornea is contained in the eye.

A perforated wound of the cornea which does not involve any other part is serious in proportion to its extent, and to the probability of its being infected. Every perforating corneal wound is followed by loss of the aqueous humor, which flows away through it, and by consequent collapse of the anterior chamber; but in itself this is not a serious event. Short wounds close almost at once, the aqueous humor is rapidly restored, and no harm is done to the eye beyond a slight opacity, which, if in the pupillary area, may cause some defect of vision; or, should the wound be situated more peripherally, and should the iris have lain against the cornea for a while, adhesions may form.

Long wounds which may even occupy the cornea in its entire diameter without directly involving any other organ of the eye, are almost certain to be complicated by prolapse of the iris between the lips of the wound, and when healing takes place the prolapsed portion becomes permanently incarcerated in the cicatrix. At the least this incarceration, if allowed to remain, causes irregularity in the curvature of the cornea, and consequently irregular astigmatism. But it may be the starting-point of a staphyloma of the cornea, it may

become the cause of glaumatous intraocular tension, or it may take on septic inflammation, which may spread rapidly to the deeper uveal structures, leading to panophthalmitis and loss of the eye.

In small uncomplicated perforating wounds, without prolapse of iris, the aqueous humor being still wanting, atropine should be freely used if the wound be towards the centre of the cornea, or eserine if it lie toward the periphery, with the object of preventing adhesions of the iris to the posterior aspect of the wound, and a bandage should be applied to the eye.

Cataract.—(An opacity of the lens or its capsule.) A cataract may be complete, occupying only part of the lens. Senile cataract is the most common. It ususally occurs in persons over 50 years of age. In commencing or incipient senile cataract the opacity is found in the cortical layers of the lens, especially at its equator, and in the latter position can often only be detected with the opthalmoscope, even when the pupil is dilated with atropin. Gradually the cataract extends to other parts of the lens, until the whole portion is opaque. As soon as the whole of the cortical substance has become opaque, the swelling of the lens begins to subside, and the anterior chamber finally regains its normal depth. If there be no glittering sectors in the cortex, the cataract is now 'mature' or 'ripe' for operation; if an extraction operation be now undertaken, it is possible to deliver the lens in its entirety; whereas, prior to this stage, some cortical substance would have been liable to adhere to the capsule, and be left behind. But a cataract is immature, despite the absence of shadow from the iris, of the illuminable pupil, and even though the anterior chamber be of normal depth, if the cortex present well-marked, glittering sectors.

In persons over 60 years of age, in whom the nucleus is usually large, a cataract which does not come up to the strict standard of maturity may be completely removed and, at that time of life, if the patient were materially incommoded for want of sight, the surgeon should operate and not wait for absolute maturity. The foregoing is the most common course of events in the progress of a senile cataract.

After the stage of maturity a cataract gradually goes on to hypermature. Here one of two changes takes place; either the cortical substance breaks down, and becomes fluid, the necleus retaining its consistency, and gravitating to the lowest part of the capsule (Morgagnian cataract); or, more commonly, the cortical substance dries up, as it were, and finally comes to form, with the nucleus, a hard flat disc. Accompanying these changes in the lens substance are changes in the epithelium lining of the inner surface of the anterior capsule, which result in a thickening of the capsule. In a Morgagnian cataract the fluid cortex

finally undergoes absorption, and the anterior and posterior capsules come in contact (*cataracta membranacea*). In some cases the capsules remain more or less transparent, and the sight may greatly improve. Some cases are on record of spontaneous cure of cataract, due to intracapsular absorption. In advanced stages of the disease, as the opacities occupy a great portion of, or the entire cortex, they are easily recognized even by ordinary daylight, often giving a grayish appearance to the pupil.

Diabetic Cataract is a complete opacity of the crystaline lens occurring in diabetes, and due to disturbed nutrition. With *Congenital* cataract, defects of the choriod or retina, or congenital amblyopia without ophthalomscopic appearances, are sometimes present, and these are usually indicated by nystagmus, or rolling of the eyeball. *Black Cataract* is extreme sclerosis of the lens, in which it sometimes assumes a dark brown color; but in other cases the lens is black. *Central Lental Cataract* is congenital and non-progressive, and is an opacity of the central, or oldest, lens-fibers while the peripheral layers remain clear. *Zonular, or Lamellar, Cataract* is congenital, or forms in early infancy, and is very common in children. *Anterior Polar, or Pyramidal, Cataract* may be congenital or acquired. In the former case it must be referred to some inflammatory disturbance occurring about the third period of development of the lens. *Fusiform, or Spindle-shaped, Cataract* is congenital, consists in an axial opacity extending from pole to pole, and may be combined with central or lamellar opacity. *Posterior Polar Cataract is a* partial kind of secondary cataract.

Treatment.—No external local applications, nor internal medicines, are of any avail in the treatment of cataract at any stage. Removal of the cataract from the eye by operation is the only cure for blindness caused by it. In cases of incipient cataract, or in those, rather, which have advanced somewhat beyond this stage, vision may be improved, or made more pleasant, by wearing tinted glasses to moderate the light; for commencing cataract, where slight myopia has come on, use concave glasses for distant vision; for reading stenopeic (narrow-slit) glasses sometimes give good results. Patients with incipient or advancing cataract should use their sight.

Operation for Cataract.—The instruments required are: A wire eye-speculum, a fixation forceps with spring catch, a von Graefe's cataract knife, a curved iris forceps, an iris scissors, a bent syctotome, a hard rubber spoon and a hard rubber, tortoiseshell, or silver spatula. Before proceeding to operate, the eye is thoroughly cocainized by the instillation of about three drops of a 4 per cent. solution of cocain, at intervals of two or three minutes. See also REFRACTION.

EYE'BRIGHT (*Euphrasia*): genus of plants of the nat. ord. *Scrophulariaceæ*, having a tubular calyx, the upper lip of the corolla divided, the lower of three nearly equal lobes, the cells of the anthers spurred at the base, a two-celled capsule and striated seeds. (See EUPHRASY.) Some of the species are root-parasites. COMMON E. (*E. officinalis*), is a little plant of at most six or eight inches in height, with ovate serrated leaves, and white or reddish flowers streaked with purple, appearing singly in the axils of the leaves. It is very abundant in many pastures in Europe, and even on high mountains, where—as in far northern regions—it is often seen of only an inch in height, gemming the ground abundantly with its bright little flowers. It is a very widely distributed plant, a native of most parts of the n. of Asia, the Himalaya, etc. It was formerly in great repute as a cure for ophthalmia, and is still much used in rustic practice for diseases of the eye. A spot on the corolla, something like a pupil, gave it much of its reputation, while the fanciful doctrine of *signatures* prevailed in medicine; but it has been found really efficacious in catarrhal inflammations of the eye, and in other catarrhal affections. It is a weak astringent. It is the *Euphrasy* of Milton, with which he represents the archangel Michael as *purging the visual nerve* of Adam.

EY'ERMAN, JOHN: American geologist; b. Easton, Pa., 1867, Jan. 15. He studied at Lafayette College, Harvard, and Princeton, 1889–95, and was instructor in blow-piping at Lafayette 1888–93, and lecturer on determinative mineralogy. He has been an associate editor of the *American Geologist* since 1890, and is a member of many English and American scientific societies. He has published: *Notes on Geology and Mineralogy* (1889); *Mineralogy of Pennsylvania* (1891); *Course in Determinative Mineralogy* (1892); *Bibliography of North American Vertebrate Palæontology* (1889–93); *The Genus Temnœyon* (1895); *A Study of Genealogy* (1898); *General Index to the Wills of Northampton County, 1752–1802* (1898); *The Old Grave Yards of Northampton* (1899–1901); *Some Letters and Documents* (1900); *Genealogical Studies* (1902).

EYLAU, *ī'low*, usually called Prussian Eylau: town in the govt. of Königsberg, 22 m. s. of the town of Königsberg; celebrated for the battle between Napoleon and the allies—Russians and Prussians—under Bennigsen, 1807, Feb. 8. The French force amounted to about 800,000, and the allies numbered 58,000, but were superior in artillery. The battle opened soon after daylight with a furious attack by the French left on the Russian right and center, which proved utterly unsuccessful, the attacking corps being almost destroyed. The murderous struggle was repeatedly renewed, and

the promise of victory alternated now to the one side and now to the other. Night closed upon the whole allied line pressing onward and driving the French before them. Nevertheless, the victory is generally claimed by the latter, chiefly because the allied forces, unable to recruit their strength, were ordered to retreat from the field on the night of the battle, and to retire upon Königsberg. The loss of the allies is estimated at about 20,000, while that of the French must have been considerably greater.—Pop. of town abt. 3,600.

EYOT, n. *ī'ŏt* or *āt* [As. *ey,* or *ig;* Icel. *ey,* an island: a little island in a river or lake: usually written *ait.*

EYRANT, or AYRANT, a. *ā'rant:* in *her.,* term applied to eagles and other birds in their nests.

EYRE, n. *ār* [Of. *eirre,* a journey—from L. *iter,* a journey—gen. *itĭnĕrĭs,* of a journey]: in *law,* a journey in circuit of certain judges: see EIRE, JUSTICES IN.

EYRE, *ār,* EDWARD JOHN: explorer and colonial governor: b: Yorkshire, 1815, Aug. 5; d. Tavistock, Devonshire, 1901, Dec. 21. Emigrating to Australia at the age of 17, he was prosperous, and soon became a magistrate. In 1840, he failed in an attempt to explore the region between S. and W. Australia—a task which he accomplished in 1841 in spite of enormous difficulties. In 1846, he became lieutenant governor of New Zealand, and in 1852 of St. Vincent. In 1862 he was appointed governor of Jamaica, where in 1865 negro disturbances broke out. Eyre, resolving upon prompt measures, proclaimed martial law; a Mr. Gordon, believed to have had a leading part in the rising, was hurriedly tried by court-martial, and hanged two days after, the sentence having been confirmed by Eyre. A commission sent to inquire into this case, found that Gordon had been condemned on insufficient evidence, and Eyre was recalled. On his return he was prosecuted for murder by a committee, of whom J. Stuart Mill was the most prominent; Mr. Carlyle and Sir R. Murchison promoted the Eyre defense fund. The charge of murder was dismissed by the magistrates of Market-Drayton 1867.

EYRE, LAKE: a salt lake of South Australia, lying due north of Spencer Gulf, at an altitude of 79 ft., and with an area of 3,706 sq. m. Except in the season of rains, this lake is generally a mere salt marsh, and has no apparent outlet. It was discovered in 1840 by Eyre.

EYRE-TODD, GEORGE: Scottish miscellaneous writer; b. Govan, Scotland, 1862, June 2. He was educated at Glasgow University. He has published: *The Lady of Ranza* (1884); *The Sage of Thebes* (1885); *Ossian* in Canterbury Poets Series (1888); *Sketch Book of the North* (1890); *Byways of the Scottish Border* (1892); *Scotland; Picturesque and Traditional* (1895); *Vignettes of the North* (1895); *Anne of Argyle* (1895);

The Book of Glasgow Cathedral (1898); *Bohemian Papers* (1898); *Byways of Scottish Story* (1900); *Songs of Caledonia* (1900); *The Glasgow Poets* (1902); *Autobiography of Crimean Simpson* (1903); *The Rebel's Wife* (1905); *Glasgow Notables* (1905), etc.

EYRIA, *ī'rĭ-a* PENINSULA: on the south coast of South Australia, triangular in shape, its base being formed by the Gawler Range, while its sides are washed on the southeast by Spencer Gulf, and on the southwest by the Great Australian Bight. It constitutes a rich pastoral country.

EYRIE, or EYRY, n. *ē'rĭ* or *ā'rĭ* [OF. *aire*, an eyry or nest of hawks (see AERIE)]: the nest of a bird, especially of a bird of prey; spelled also *aerie*. EYAS, n. *ī'ăs* [F. *niais*, simple; originally meant, 'caught in the nest'—from *nīdus*, a nest]: a young hawk just taken from the nest, and not able to prey for itself.

EYSTER, NELLIE BLESSING: American writer; b. Frederick, Md., 1836, Dec. 7. She was married to A. S. Eyster 1853. She has published: *Sunny Hours* (1865); *On the Wing* (1860); *Robert Brent's Three Christmas Days; Lionel Wintour's Diary* (1882); *A Colonial Boy* (1895); *The Bright Side of Chinese Life* (1901); *Opportunity and I* (1901); *A Chinese Quake* (1902), etc.

EYTH, EDUARD, *ĕd'oo-ârd īt:* German poet; b. Heilbronn, Würtemberg, 1809, July 2; d. New Ulm, 1884, April 28. He was author of a volume of *Poems* (1843); *Pictures in Frames* (1856); and a version of the *Odyssey*.

EYTINGE, *ĕt'tĭng*, ROSE: American actress; b. Philadelphia, 1838, Nov. 21. She made her début as an amateur in Brooklyn, N. Y., 1852, and the following year played through the West in a stock company. She has created many parts, including Rose Michel, Amande Chandoce in *Led Astray*, and Felicia in the play of that name, but has been especially successful in her playing of Shakespearean roles, notably Cleopatra, Lady Macbeth, and Hermione (in the *Winter's Tale*). She has written: *It Happened This Way*, a novel; *Golden Chains*, a play; and has dramatized Browning's *Colombe's Birthday*, and Dickens' *Dombey and Son; David Copperfield; Oliver Twist; Tale of Two Cities*, and other works.

EZEKIEL, *ĕ-zē'kĭ-ĕl* (meaning 'God will strengthen,' or 'strength of God'): one of the Hebrew prophets, son of the priest Buzi. With Jehoiachin, King of Judah, he was carried captive, when still a young man, to Mesopotamia, by order of Nebuchadnezzar, about B.C. 598. He was a member of the Jewish community which settled on the banks of the river Chebar, and first appeared as a prophet about B.C. 594. His prophetic

career extended over a period of 22 years. The date of his death is not recorded.

The Book of Ezekiel consists of three parts: the *first* (chapters i.–xxiv.), composed before the final conquest of Jerusalem by Nebuchadnezzar, announces the complete overthrow of the kingdom of Judah, on account of its increasing unfaithfulness to God; the *second* (chapters xxv.–xxxii.) threatens the surrounding nations, which were exulting maliciously over the ruin of Judah, with divine punishment; and the *third* (chapters xxxiii.–xlviii.) prophesies the future deliverance of the Hebrew nation, and the rebuilding of Jerusalem. This last portion is generally believed to contain several Messianic predictions, three of which are considered specially remarkable (chaps. xxxvi., xxxvii.; xxxviii., xxxix.; and xl.–xlviii.); and it is beyond all question that only under a world-wide dispensation like the Christian can the glorious visions of the prophet receive a historical realization. The book is full of magnificent but artificial symbolism, and of allegories difficult to understand; whence Jerome calls it 'a labyrinth of the mysteries of God;' but here and there, as in chapters i. and ii., it contains visions that indicate a most vivid and sublime imagination. Ezekiel's authorship of the book has been questioned. The Talmud says, it was written by the Great Synagogue, of which Ezekiel was not a member; and Ewald, believing that traces of later elaboration are obvious, suggests that the collection and combination of the various prophesies into a book may not have been the prophet's own doing. The opinion of most critics, however, is that a prophet who was so much of a literary artist as Ezekiel, was more likely to have completed the book himself than to have left such a work to others. The text is far from being in perfect condition. It is partly corrupted by glosses, has partly been retouched by later hands, and may often be amended by the Septuagint version. See commentaries and works on Ezekiel by Hävernick, Hitzig, Ewald (in *The Prophets of the Old Testament*), Fairbairn, Hengstenberg, Keil.

EZEKIEL, Moses Jacob: American sculptor; b. Richmond, Va., 1844, Oct. 28. He was graduated at the Virginia Military Institute 1866, having served in the Confederate army during the last year of his course. He studied art in Richmond and Cincinnati 1866–70, and Berlin, Germany, 1870–4, where he was the first foreigner to win the Michael Beer prize (1873). While there he studied under Prof. Albert Wolf, and was admitted to the Berlin Society of Artists on the merits of his colossal bust of Washington, now in Cincinnati. Later he went to Rome, Italy, where he has chiefly resided save for frequent visits to America. He has exhibited in the chief American and European expositions, large and small, including statues, portrait-

busts, ideal groups, and relievos. His works number several hundred of which the best known are: *Cain, or the Offering Rejected,* an early ideal bust that showed considerable dramatic talent; *Schiller and Goethe,* Berlin (1870); *Religious Liberty,* Fairmount Park, Philadelphia (1874–6); bas-relief portraits of Farragut (1872), and Robert E. Lee (1873); 12 marble statues of artists for the Corcoran Art Museum, Washington (1880–2); marble busts of Beethoven (1884), and of Cardinal Hohenlohe (1888); bronze statue of Columbus in the Columbian Memorial building, Chicago, Ill.; statue of Mrs. Andrew D. White for Cornell University; bust of Lord Sherbrooke for Westminster Abbey; the fountain of Neptune for the town of Neptune, Italy, etc. In June 1903 the sculptor presented a bronze monument *Virginia Mourning Her Dead,* to the Virginia Military Institute.

EZEKIEL, Tomb of: Many legends have clustered around the traditional burial-place of Ezekiel at Kifil near Birs Nimrud, a favorite resort for pilgrims, Mohammedan and Jews, for many centuries. The mausoleum, probably from the era of the caliphs, contained a collection of Hebrew books in the twelfth century, among the rest, a scroll of the law, said to have been written by the prophet. The tomb, made a kind of store-house of votive offerings, which were said to have miraculous power, has a spire which is the frustum of an elongated cone, tapering to a blunted top by a succession of steps and peculiarly ornamented. See Benjamin of Tudela, *Itinerary;* Layard's *Nineveh and Babylon.*

EZRA, *ĕz'râ:* Jewish lawgiver, B.C., 5th c.; descended from a distinguished priestly family, and resident in Babylon in the reign of Artaxerxes Longimanus. With this monarch he seems to have been in considerable favor, and obtained permission B.C. 478 to return to Jerusalem with a band of his countrymen amounting to 1754. His services to the new colony in regard to their civil and religious condition were very important. He endeavored to re-impose more strictly the law of Moses, forbidding marriages with heathen women, and disannulling such ties where they had been formed. He also introduced into Jewish literature the square Chaldee character, instead of the old Hebrew or Samaritan one, which had been customary till then; but the tradition that he re-wrote from memory the sacred books burned at the destruction of the temple, deserves no regard; and it is likewise a mere tradition that as president of the so-called Great Synagogue (an assemblage of Jewish scholars) he arranged and completed the canon of the Old Testament. (See Bible.)—The book called by his name, with the book of Nehemiah, formed, among the Jews, the first and second books of Ezra. It records events which extended over

nearly 80 years, and divides itself naturally into two parts. The first six chapters embrace a period of 21 years, and relate the history of the first return from the Babylonian captivity; the rest of the book chronicles the *second* return under Ezra the priest, in the reign of Artaxerxes Longimanus. The book is written partly in Chaldee; and is by some critics supposed to be the work of various authors. But the Jews have always maintained its canonical authority, and have even compared Ezra with Moses. Those who ascribe to him the authorship of the whole book, consider that he drew from various sources the materials for the first part. The second part relates events in which he was himself the leader.

EZRA CHURCH (Atlanta), BATTLE OF. On July 20, 1864, the Confederate army under Gen. Hood was defeated at Peach Tree Creek, and driven into the inner defenses of Atlanta. On the 22d Hood attacked the Army of the Tennessee, and was again defeated, and Gen. Sherman began the investment of Atlanta. He began to force Hood from Atlanta by moving upon his communications leading south from the city. The army of the Tennessee was transferred from the extreme left of the investing line to the right, near Ezra Church, and Hood took measures to check its further extension and drive it back. On the night of the 27th he marched out of Atlanta with the greater part of his force, and on the 28th Gen. J. C. Brown's division was ordered to attack Logan's corps, then advancing on the right, and drive it back to and beyond Ezra Church. Brown drove in Logan's skirmishers, followed them 500 to 600 yards, and struck Logan's right, carried it at some points, but was quickly repulsed with great slaughter. He made a second attempt with no success and fell back. During Brown's attack four regiments from Dodge's and Blair's corps extended Logan's right, and took part in the action. Clayton's division attacked on Brown's right, but not until after Brown's first repulse, and by a misunderstanding his three brigades made isolated attacks upon Harrow's division, all of which were repulsed with great loss. Walthall had led out his division while Brown and Clayton were engaged, and at 2 P.M., after they had been withdrawn, he was ordered to attack over the ground of Brown's fight. Walthall made several persistent efforts, but failed, although some parts of his force got within 50 yards of Logan's line. After more than an hour's severe fighting, in which he reports the loss of 152 officers and nearly 1,000 men, he fell back. At night Hood withdrew his troops to Atlanta. The Federals in this battle numbered about 13,000 men; the Confederates about 18,000. The Union loss was 559 killed and wounded, 73 missing. The aggregate Confederate losses were apparently about 2,636 killed and wounded, and 200 missing.

F.

F, f, *ĕf:* sixth letter in the Latin and English alphabets corresponding to the *Vau* of the Hebrew, and the *Digamma,* of the old Greek alphabet: see ALPHABET. *F* and *v* are called *labio-dentals,* from the organs employed in sounding them; they belong to the class of consonants called aspirates (q.v.), and bear the same relation to each other that exists between the unaspirated labials *p* and *b*. In Latin, *f* had a peculiar sound, different from that of Greek φ, as we learn from Cicero and other Latin writers. What the sound was, we do not exactly know, but it approached a strongly breathed *h,* as is indicated by the fact that in the Sabine dialect it sometimes takes the place of *h,* as Sab. *fircus* = Lat. *hircus* (a he-goat); and the Latins made use both of *faba* and *haba* for 'a bean.' This affinity is also shown in modern Spanish, where *h* takes the place of the Latin *f;* as Lat. *femina,* Sp. *hembra; fl* becomes, in Spanish, *ll,* as Lat. *flamma* = Sp. *llama.* F in English and other Teutonic tongues, corresponds to *p* in Greek and Latin; as Lat. and Gr. *pater* = Eng. *father;* Gr. *pod-,* Lat. *ped-* = Eng. *foot;* Lat. *pisc-* = Eng. *fish;* Gr. *pur* = Eng. *fire;* Lat. *vulp-* = Eng. *wolf.* In some words, *v* takes the place in German of *f* in English; as Ger. *vater* = Eng. *father;* Ger. *vier* = Eng. *four.* In the Aberdeenshire dialect, *f* takes the place of *wh,* as *fat* for *what; fup* for *whip.* This seems to be a relic of the Teutonic pronunciation of *w* (=*v*), still observed in the Cockney pronunciation of *vill* for *will, ven* for *when;* but why the sharpening of the labial into *f* should be confined to one circumscribed district of Scotland, and to the case of *w* followed by *h,* is not evident.

F in Lat. and Greek becomes *b* in Eng.; as Gr. and Lat. *fer-* = Eng. *bear;* Lat. *frater* = Eng. *brother.* See Letter B.

More remarkable are the interchanges between *f* and the series *d, th, t.* Lat. *foris* = Gr. *thura,* Eng. *door;* Lat. *fera* = Gr. *ther,* Eng. *deer;* Eng. *red,* Skr. *ruthira,* Gr. *eruthros,* Lat. *rutilus, rufus, ruber.* In Russian, *Feodor, Afanasja* = *Theodor, Athanasia.* In words originally common to both Greek and Latin, the Greek φ is represented in Lat. by *f;* as Gr. φημη = Lat. *fama.* But in spelling Greek words with Latin letters, the Romans, after the time of Cicero, were careful to represent φ, not by *f,* which had a somewhat different power, but by *ph.* This mode of spelling words derived from Greek is still adhered to in English, German, and French, though the distinction in sound has long been lost sight of. The distinction began to disappear in the Latin itself in the time of the later Roman emperors, when inscriptions show such spelling as *Afrodite* for *Aphro-*

dite; and this simplification is followed in modern Italian, Spanish, and Portuguese. *Ph* is sometimes erroneously used in words having no connection with Greek; as Adolphus, for the Teutonic Adolf or Adalolf—i. e., 'noble wolf.

F, as a numeric symbol, is used for 40, and with a dash over it for 40,000.

F, in Music: fourth note of the natural diatonic scale of C; stands in proportion to C as 4 to 3, and is a perfect fourth above C as fundamental note. F major, as a key, has one flat as its signature—viz., B. flat. F minor has four flats the same as A flat major, of which it is the relative minor.

FA, *fâ:* in *music,* the fourth sound in the scale of the solfa notation = F.

FAAM, *fā'am,* or FAHAM, *fā'ham* (*Angræcum fragrans*): an orchid, native of India and the Mascarene Isles, much prized in the East for the delightful fragrance of its leaves, due to the presence of *Coumarine* (q.v.), and resembling that of the Tonka Bean and of Vernal Grass. In the Isle of Bourbon, an infusion of F. leaves is in great repute as a cure for pulmonary consumption and as a stomachic. In France, it has been successfully used under the name of *Isle of Bourbon Tea,* as an expectorant, anti-spasmodic, and stomachic.

FABACEOUS, a. *fă-bā'shŭs* [L. *faba,* a bean]: bean-like; pertaining to a bean. FABACEÆ: see LEGUMINOSÆ.

FABER, n. *fā'bėr* [L.]: a fish, the dory.

FABER, *fâ'bėr,* CECILIA BÖHL VON: 1797–1877, Apr. 7; b. Morges, Canton de Vand, Switzerland: Spanish novelist. She received the greater part of her education in Germany, learned German, Spanish, Latin, English, French, and Italian languages; and married first, 1814, Capt. Planells, with whom she lived in the United States some years; then, on his death, the Marques de Arco Hermosa, who introduced her to the court at Madrid; and, again becoming widow 1835, Senor de Arrom, a lawyer with whom she had little happiness. It was not till after her 50th year that she became an author, and assumed the masculine pseudonym *Fernan Caballero.* Her first novel was *La Gaviota,* and appeared in instalments in a Madrid newspaper 1849. It was followed by *Elia, Clemencia, La Familia de Alvareda, Una en Otra, Simon Verde,* and numerous *Cuadros de Costumbres populares,* all of which in translated form achieved a European reputation. In 1859 she was appointed governess to the royal children, and an edition of her works in 13 vols. was issued from the royal printing press.

FABER, *fā'ber,* FREDERICK WILLIAM, D.D.: 1814, June 28—1863, Sep. 26; b. Calverly, Yorkshire, England: hymnologist and theologian. He graduated at Oxford 1836; became rector of Elton 1843; adopted the Rom. Cath. faith 1845; founded a religious community at Birmingham, called Wilfridians, which was merged into the oratory of St. Philip Neri and established in London 1849 and at Brompton 1854; and presided over the oratory till death. He had a deeply fervent devotional spirit and was an elo-

quent preacher, a lovable man, and author of the hymns: *The Greatness of God, The Will of God, The Eternal Father, The God of My Childhood, Jesus is God, The Pilgrims of the Night, The Land Beyond the Sea, Sweet Saviour, bless us ere we go, I was Wandering and Weary,* and *The Shadow of the Rock.* He also edited the *Oratorian Lives of the Saints,* and published numerous essays, tracts, and doctrinal works.

FABER, GEORGE STANLEY: Anglican clergyman and author: 1773, Oct. 25—1854, Jan. 27; eldest son of the Rev. Thomas F. He entered Univ. College, Oxford, 1789, where he achieved a brilliant academical reputation. Before his 21st year, he was elected fellow and tutor of Lincoln College. In 1796, he took his degree of M.A.; was Bampton lecturer 1801, in which capacity he delivered the lectures subsequently published under the title of *Horæ Mosaicæ;* and 1805 became vicar of Stockton-on-Tees, Durham. After several changes, he received 1832, the mastership of Sherburn Hospital, near the city of Durham, where he died. F. wrote more than 40 works, several of which, especially those on prophecy, have had extensive popularity. All his writings show classical erudition, and 'a hearty love of hypothesis.' The principal are—*The Genius and Object of the Patriarchal, the Levitical, and the Christian Dispensations* (1823, 2 vols.); *The Difficulties of Infidelity* (1824); *The Sacred Calendar of Prophecy* (1828, 3 vols.); *The Primitive Doctrine of Election* (1836), reckoned by some critics his best work; *The Primitive Doctrine of Justification* (1837); and *Eight Dissertations upon the Prophetical Promises of a Mighty Deliverer* (1845, 2 vols.).

FABER, *fâ-bā'* (or LEFÈVRE), JACOBUS: 1450–1536; b. Etaples, Picardy, France: pioneer of Protestantism in France. He was of humble parentage, but graduated at the Univ. of Paris. He taught some time, pursued classical studies in Italy, and became prof. of the college of Card. Lemoine in Paris. In 1507, he went to the Benedictine abbey of St. Germain des Près, near Paris, to reside, and there applied himself to Biblical study. Previously he had published with commentaries the *Physics, Methaphysics,* and *Ethics* of Aristotle; now he began more important labors. In 1509 he brought out *Quintuplex Psalterium; Gallicum, Romanum, Hebraicum, Vetus, Conciliatum;* 1512, *S. Pauli Epistolæ* xiv. *ex vulgate Editione, adjecta intelligentia ex Græco cum commentariis;* 1517, *De Maria Magdalena et triduo Christi disceptatio,* which was condemned by the Sorbonne; and 1523 his French translation of the New Test. and *Les Épistres et Évangiles pour les LII. dimanches de l'an à l'usage du diocèse de Meaux.* He was condemned and had his works suppressed by parliament 1525, but the proceedings were subsequently quashed; became librarian in the royal palace at Blois 1526; published a translation of the Pentateuch 1528; and completed his translation of the Bible 1530.

FA'BER, JOHN: d. prob. 1756; son of John F. (mezzo-tint engraver, b. Holland, came to England, d. Bristol, 1721, May): like his father an engraver in mezzo-tinto. His principal works are the portraits of the Kit-Cat Club, and

the Beauties of Hampton Court, several of which are executed with great freedom, vigor, and beauty. F. lived in London, where he is believed to have died.

FABIAN, a. *fā'bĭ-ăn:* applied to tactics, or to a policy of careful waiting and watching without any positive conflict, in order to weary out an opponent, or take advantage of his errors—so named from Quintus *Fabius* Maximus (see FABIUS). FABIAN GENS: see FABIUS.

FABIUS, *fā'bĭ-ŭs:* name of one of the oldest and most illustrious patrician families of Rome. Three brothers of this name alternately held the office of consul for seven years (B.C. 485–479). In 479, the Fabii, under K. Fabius Vibulanus, migrated to the banks of the Cremera, a small stream that flows into the Tiber a few miles above Rome. Here, two years afterward, they were decoyed into an ambuscade by the Veientes, with whom they had been at war, and with the exception of one member, who had remained at Rome, and through whom the race was perpetuated, the entire *gens,* 306 men, were put to the sword.—The most eminent of the Fabii were Quintus Fabius Rullianus—supposed the first who obtained for himself and his family the surname of *Maximus*—and his descendant, Quintus Fabius Maximus Verrucosus, named Cunctator, the Delayer. The former was the most eminent of the Roman generals in the second Samnite war, was twice dictator, and six times consul.

FABIUS CUNCTATOR (d. B.C. 203), who, in the course of his career, was five times consul, and twice censor, was elected dictator immediately after the defeat of the Romans at Trasimenus. The peculiar line of tactics which he observed in the second Punic war obtained for him the surname by which he is best known in history. Hanging on the heights like a thundercloud, to which Hannibal himself compared him, and avoiding a direct engagement, he tantalized the enemy with his caution, harassed them by marches and counter-marches, and cut off their stragglers and foragers, while his delay allowed Rome to assemble her forces in greater strength. This policy—which has become proverbial as 'Fabian policy'—although the wisest in the circumstances, was not appreciated either in the camp or at home; and shortly afterward Marcus Minucius Rufus, Master of the Horse, was raised to an equal share in the dictatorship, a position, however, which he held only a short time. During his fifth consulship, Fabius recovered Tarentum, which had long been one of Hannibal's important positions.

C. FABIUS, surnamed Pictor, executed upon the walls of the temple of Salus—dedicated by the dictator C. Junius Brutus Bubulus in 302—the earliest Roman paintings of which we have any record; and his grandson Q. Fabius Pictor, was the first writer of a Roman history in prose.

FABLE, n. *fā'bl* [F. *fable*—from L. *fabŭlă,* a story]· a short tale or story intended to instruct or amuse, the incidents of which are improbable: an idle story; a falsehood: V. to write fiction; to tell falsehoods; to feign. FA'BLING,

imp. *-blĭng:* ADJ. dealing in fables. FABLED, pp. *fā'bld:* ADJ. feigned; celebrated in fables. FA'BLER, n. one who. FABULIST, n. *făb'ū-lĭst,* a writer of fables. FAB'ULOUS, a. *-lŭs,* full of fables, pretended or feigned; fictitious. FAB'ULOUSLY, ad. *-lĭ.* FAB'ULOUSNESS, n. FAB'ULIZE, v. *-līz,* to compose fables; to write or speak in fable. FAB'ULI'ZING, imp. FAB'ULIZED, pp. *-līzd.*—*Fable* is a word of twofold signification. First, it is employed by some writers in a general sense to denote any fictitious narrative, as for example, the incidents in an epic or dramatic poem. At one time also, when the myths of the Greeks and Romans were thought to be satisfactorily accounted for by regarding them as conscious inventions of the ancient poets and priests, it was customary to speak of them as *fables,* but this application of the term is now abandoned by scholars: see MYTH. According to the second and more frequent signification of the word, Fable denotes a special kind of literary composition, either prose or verse, in which a story of some kind is made the vehicle for conveying a universal truth. It differs from a parable in this respect, that while the latter never transcends in conception the bounds of the probable or the possible, the former always and of necessity does. The story of the 'Good Samaritan' imagined by the Savior, is a parable; if it was not history, it might have been, for it contains nothing either improbable or impossible; but when Jotham went up to the top of Mount Gerizim and spoke to the men of Shechem about the trees going forth to anoint a king over them, he made use of a fable proper. The peculiarity, therefore, of the *structure* of the fable consists in the transference to inanimate objects, or, more frequently, to the lower animals, of the qualities of rational beings. By the very novelty and utter impossibility of the representation, the interest of the hearer or reader is excited, and thus its symbolic meaning and moral become transparent to him, at least if the fable is well contrived. The ancient fabulists were simple, clear, and earnest in their representations. They seem to have sprung up in the East. Among the more celebrated are Bidpai (q.v.), or Pilpai; and the Arabian Lokman, said to have lived in the time of King David. Among the Greeks, the greatest fabulist is Æsop (q.v.), whose fables, at a much later period —the precise time is not exactly known—were versified by a certain Babrius (q.v.). Among the Romans, Phædrus cleverly imitated Æsop, but with considerable modifications, thus giving some independent value to his work. The well-known fable of the *Town Mouse and Country Mouse,* told by Horace, is of purely Roman origin, and is probably the only one in existence of which that can be affirmed. Leaving the classical period, and before entering on the dark ages, we encounter the name of Aphthonius, in the early part of the 4th c., who wrote inferior fables in Greek prose; and still later, the name of Flavius Avianus, who composed 42, no better, in Latin elegiacs. During the dark ages, the fable in various forms appears to have been cultivated in the monasteries, though nothing meritorious has survived; but in the midle ages, it acquired fresh life and vigor. An

edition of the fables current in Germany in the time of the Minnesingers has been published by Bodmer. The oldest known German fabulist is Stricker, about the middle of the 13th c.; but the famous mediæval fable of *Reineke Fuchs*, or the History of Reynard the Fox (q.v.), stretches in some of its numerous primitive forms much further back. In later times, most nations have cultivated the fable with more or less success; among the English, Gay; among the Germans, Hagedorn and Gellert, and Lessing; among the Italians, Pignotti; among the Russians, Krylov; and above all, among the French, La Fontaine, whose fables are remarkable for their arch and lively humor, their delicate sarcasm, their sagacity, and felicity of expression. Now, however, the fable has gone out of fashion.—Syn. of 'fable, n.': parable; allegory; fiction; fabrication; novel; romance; story; tale; apologue; untruth; invention.

FABLIAU, plur. Fabliaux, *făb-lē-ō* [from Latin *fabulari, fabellare*, to speak or to tell]: name given in the old French literature to a class of short metrical narratives, intended merely for recitation, which had for their subject-matter the talk and news of the day in the middle ages. The narrator of such news was called a *fableor* (plur. *fablière*), in opposition to the *chanteor*, or singer proper, who composed poems not only for recitation, but also for singing. Besides the fabliaux, the department of the fableor embraced the *Romans d'aventure* (in short unstrophied couplets), usually called *contes*, whence their author or reciter also bore the name of *conteur;* and the *dits*, or sayings, the special cultivator of which was termed a *diseur*. As the fabliaux were fundamentally distinguished from the more genuine forms of poetry by the everyday character of their subject-matter, so the mode of treatment which their authors adopted was also more anecdotical, epigrammatic, and witty—the wit being richly spiced with scandal. They appear to have maintained a sort of ironical and parodistic antagonism to the idealism of the epics of chivalry. In these fabliaux, the essential character of the French people manifested itself, with that opposition of the real to the ideal, of the understanding to the imagination, which, after the time of Francis I., began to characterize French literature generally. Thus they lashed not only the priesthood and the nobility in their actual degeneracy, but from the very character of their satire, they engendered a contempt for the religious-chivalric spirit itself, and for all ecclesiastical and knightly notions and ceremonies. The oldest fabliaux are not of French origin; they are a fruit of the Crusades, and were brought to France from the East, but they received a national coloring, and soon took root in the West. From them sprang the drama of France. One of the most fecund fablière was Rutebeuf, who lived in the reigns of Louis IX. and Philippe III., whose works were published by Jubinal (2 vols., Paris 1837). He was a true Parisian, and the prototype of Villon, La Fontaine, and Voltaire. The best collections of fabliaux and contes are those of Barbazan (5

vols., Paris 1756), of Méon (2 vols., Paris 1823), and of Jubinal (2 vols., Paris 1839–43).

FABRETTI, *fâ-brĕt'tē,* Raffaele: antiquary and archæologist: 1618–1700; b. Urbino. He was attracted at an early period to antiquarian studies by the great classical remains of Rome. Under Pope Alexander VII. he became papal treasurer, and subsequently was chancellor to the papal embassy at Madrid. A residence of 13 years in Spain enabled him to explore all the antiquities of the kingdom, and to carry his studies to a point which rendered indispensable his return to Rome, the great parent fount of ancient learning. He was there made judge; and under Innocent XII. became keeper of the papal archives of the castle of St. Angelo, a post which afforded the widest scope to his favorite pursuits. About this time, he wrote his two important works: *De Aquis et Aquaductibus Veteris Romæ* (4 vols. 1680, reprinted with notes and additions 1788), and *Syntàgma de Columnâ Trajani* (Rome 1683). His treatise entitled *Inscriptionum Antiquarum Explicatio* (1699) throws invaluable light on the discoveries made by himself in the catacombs; and his erudite investigations concerning the reliefs known as the Iliac Tables, and the grand subterranean canals of Emperor Claudius, are equally full of interest to science. His rare collection of inscriptions, etc., is in the ducal palace of Urbino.

FABRIANO, *fâ-brē-â'nō:* city of Italy, province of Ancona (formerly part of the Papal States), at the base of the Apennine range, 28 m. w. of Macerata. It has a cathedral, and several convents, but is notable chiefly for its great paper manufactures, established 1564. The churches contain many specimens of the school of painting which flourished here.—Pop. (1901) 22,996.

FABRIA'NO, Gentile da: Italian painter, in the early part of the 15 c.; b. at Fabriano; d. some time after 1450. He received his first instructions from his father, who appears to have been a man of superior culture, as he taught his son the elements of physics and mathematics. Fabriano's first teacher in art was, it is supposed, Allegrette de Nuzio. Subsequently, he went to Florence, and studied under Fiesole. Among his earliest works of note is a fresco of the Madonna in the cathedral of Orvieto. In 1423, he painted an 'Adoration of the Kings' for the church of the Holy Trinity in Florence. This picture is one of the most admirable belonging to the school of Giotto. To the same period belongs a Madonna with Saints (now in the Berlin Museum). Fabriano afterward went to Venice, where he greatly increased his reputation by a picture of the bloody engagement between the fleet of the Republic and that of the Emperor Barbarossa off the heights of Pirano. The Venetian senate was so delighted with the piece, that it conferred on the fortunate artist the dignity of a patrician, and a pension of a ducat *per diem* for life. Unhappily, this work has perished. Pope Martin V. then called Fabriano to Rome, and employed him, with Vittore Pisanello,

in adorning the church of St. Giovanni Laterano. As his share of the work, he painted various incidents in the life of John the Baptist, five prophets, and portraits of Pope Martin himself and ten cardinals. He died, while engaged on this building. Fabriano's pictures indicate a cheerful and joyous nature. He had a childlike love of splendor and rich ornamentation, but is never extravagant or excessive in his coloring.

FABRIC, n. *făb'rĭk* [F. *fabrique*—from L. *fabrĭca*, the art or trade of an artisan, a workshop: comp. *făcĭō*, I make]: a building; the structure of anything; texture. FABRICATE, v. *făb'rĭ-kāt* [L. *fabrĭcātus*, constructed]: to invent; to devise falsely; to frame; to construct. FAB'RICATING, imp. FAB'RICATED, pp. FAB'RICATOR, n. *-tėr*, one who. FAB'RICA'TION, n. *-kā'shŭn* [F.—L.]: the act of framing or constructing; that which is framed or invented; a falsehood; forgery. —SYN. of 'fabric': structure; construction; edifice; workmanship; framework;—of 'fabrication': see under FABLE.

FABRICIUS, *fā-brĭsh'ŭs*, or FABRIZIO, *fâ-brēt'sé-ō* GIROLAMO, commonly named from his birthplace FABRICIUS AB ACQUAPENDENTE: anatomist and surgeon; 1537–1619. He was the son of humble parents, who, notwithstanding their poverty, sent him to the Univ. of Padua, where, in addition to the usual instruction in the classics, he studied anatomy and surgery under the celebrated Fallopius with such success that on the death of the latter, 1562, Fabricius was appointed to the vacant professorship, which he held for nearly half a century, attracting students from all parts of the civilized world. Among these students was Harvey (q.v.) in 1598, who derived from Fabricius's observations on the valves of the veins the first clue to his great discovery. He was a most laborious investigator of anatomy, and on a more methodical plan than had been attempted by his predecessors. He treated of the eye, the larynx, the ear, the intestinal canal, the development of the fetus, and many other subjects. He introduced great improvements in the practice of surgery; and his *Opera Chirurgica* passed through 17 editions. He wrote numerous other surgical works: all were collected and published by Albinus 1723, more than a century after his death. The Venetian republic erected for him a spacious anatomical amphitheatre, in which his name was inscribed, and at the same time conferred upon him an annual stipend of a thousand crowns, and created him a knight of the order of St. Mark. A few years before his death he retired from professional duties, and died (some believe he was poisoned by his relatives) in his villa on the banks of the Brenta, which still bears the name of the Montagnuola d'Acquapendente.

FABRICIUS, *fâ-brĭt'sē-ûs*, JOHANN CHRISTIAN: 1745, Jan. 7—1807; b. Tondern: Danish entomologist. He studied at Copenhagen, Edinburgh, Leyden, and Freyburg, and finally at Upsala, under Linnæus, whose ideas Fabricius was zealously employed throughout his life in develop-

ing and applying. In 1775, Fabricius was appointed to the chair of natural history at the Univ. of Kiel, and from that time applied himself to the fuller development of a system of classification of insects, based upon the structure of the mouth. Although his system has been found inapplicable to many families of insects, it has been instructive. The *Systema Entomologiæ* (Copenh. 1775), in which Fabricius expounded his views, constituted a new era in entomology, and his *Genera Insectorum* (Kiel 1776), *Mantissa Insectorum* (Copenh. 1787), and *Entomologia Systematica* (Copenh. 1792), opened new fields to the entomologist. Fabricius was the author of several able treatises on the policy, statistics, and economy of Denmark, prepared in his capacity of councilor of state and prof. of rural and political economy at Kiel. Fabricius's death at Kiel was said to have been hastened by his grief at the political misfortunes of his country.

FABRILE, a. *făb'rīl* [L. *fabrilis*—from *faber*, a workman; Sp. *fabril;* It. *fabbrile*]: pertaining or relating to workmen or to handicraft, as in wood, stone, metal, etc.

FABRONI, *fâ-brō'nē*, Angelo: 1732, Feb. 7—1803, Sep. 22; b. Marradi, Tuscany: biographical writer. He was educated at Faenza and Rome, and, 1773, was appointed tutor to the sons of Leopold, Grand Duke of Tuscany. His *Vitæ Italorum Doctrina Excellentium qui Sæculo XVII. et XVIII. floruerunt* (20 vols. Pisa 1778–1805), is one of the best Italian works of its kind, and is a treasure of information; while his *Laurentii Medicei Vita* (2 vols. Pisa 1784), *Vita Magni Cosmi Medicei* (2 vols. Pisa 1788–9), are reckoned model biographies.

FAÇADE, n. *fă-sād'* [F. *façade*, the front—from It. *facciata*, the front of a building—from *faccia*, the face—from *L. facĭĕm*, the face]: exterior front or face of a building. This term, frequently restricted to classic architecture, may be applied to the front elevation of a building in any style, though generally referring to buildings of some magnitude and pretensions; thus, we speak of the *front* of a house, and the façade of a palace. The back elevation of an important building is called the rear façade, in the same inapt way as in England the back of a house is called the *'back-front.'* An edifice may have any number of façades when it shows a face or front in each direction. An elevation of the side of a building is called by some lateral façade. The sides of a court or cortile also are called façades, and are distinguished as north, south, etc., façades.

FACCIOLATI, *fât-cho-lâ'tē*, Jacopo: 1682–1769; b. Torreglia, not far from Padua: Italian philologist and critic. He was educated in the religious seminary at Padua, where he became successively prof. of theology, prof. of philosophy, and supt.-gen. of the classes, or rector of the institution. Facciolati directed his attention chiefly to the revival of the study of ancient literature, and brought out a new edition of *Lexicon Septem Linguarum*, called, from its original author, the monk Ambrosius of Calepio,

the *Calepine Lexicon*. He was assisted in this work by his pupil, Forcellini, to whom mainly is owing the conception of a totally new Latin dictionary; an arduous undertaking, which Facciolati continued till his death and which was completed by Forcellini 1771. Facciolati and Forcellini, assisted by several others, likewise published a new ed. of Nizoli's *Thesaurus Ciccronianus*. Facciolati's Latin epistles and orations are remarkable for the Ciceronian elegance of their style, and his notices on several philosophical writings of Cicero for their solidity, clearness, and taste.

FACE, n. *fās* [F. *face*—from L. *făcĭĕm*, a face, a visage]: the front or surface of anything; appearance; the countenance; look; visible state of affairs; freedom from bashfulness or confusion; boldness; presence or sight, as before the face: V. to meet in front; to meet and oppose with firmness; to cover with an additional surface; to make a false appearance; to stand opposite to. FACER, n. *-ẏr*, blow in the face; a sudden blow, check, or hindrance. FA'CING, imp. fronting or opposite: N. a thin covering placed in front for improvement or strength; a thin covering for ornament. FA'CINGS, n. plu. the movements of soldiers to make a front, to the right, to the left, etc.; the collars, lappets, cuffs, etc., of a regimental uniform, which are of distinctive colors. FACED, pp. *fāst*. FACE'LESS, a. without a face. FA'CINGLY, ad. *-lĭ*. TO SET ONE'S FACE AGAINST, to oppose. TO MAKE FACES, *-fā'sĕs*, to distort the face. FACE TO FACE, in immediate presence. TO FACE THE ENEMY, to meet him in front with determination. TO FACE IT OUT, to maintain confidently and without change of color, usually in a bad sense; to pass through the ordeal of a disagreeable personal interview with courage. FACET, n. *făs'ĕt* [F. *facette*, a little face]: a little face; a small plane surface, as of a crystal or a cut gem. FAC'ETED, a. having numerous small surfaces or faces, as cut gems. FACIAL, a. *fā'shal* [L. *facĭēs*, the face]: of or pertaining to the face. FACIAL ANGLE, the angle formed by two lines, one drawn horizontally from the nostrils to the ear, and the other upward from the nostrils to the most prominent part of the forehead (see ANGLE). FACIAL NEURALGIA: see NEURALGIA.—FACIAL PARALYSIS, paralysis of the facial nerve, involving loss of power over the muscles of the face. It may affect either side, or both sides, and is attended with loss or partial loss of the power of articulation. FACIES, n. *fā'shĭ-ēz* [L.]: in *nat. hist.*, any common resemblance or aspect among the rocks, plants, animals, or fossils of any era or epoch.

FACETIOUS, a. *fă-sē'shŭs* [F. *facétieux*, facetious—from L. *făcētĭæ*, witty or clever things—from L. *făcētŭs*, courteous, witty: It. *faccto*]: sprightly with wit and good-humor; gay; full of pleasantry; jocular. FACE'TIOUSLY, ad. *-lĭ*. FACE'TIOUSNESS, n. *-nĕs*, pleasantry; sportive humor. FACE'TIÆ, n. plu. *-shĭ-ē* [L.]: witticisms in speaking or writing.—SYN. of 'facetious': jocose; sportive; merry; pleasant; witty.

FACIES: the appearance which the countenance assumes in disease; this varies somewhat in typical cases of various diseases, owing to the predominance in one or the other of emaciation, pain, loss of fluids, etc., symptoms which impress their special stamp on the features. The *facies hippocratica*, so called after Hippocrates, who has left us a graphic description of the condition, is that which is often observed at the time of death. It is described by him as marked by sunken temples and eyes, pinched nose, relaxed lips, and livid complexion. The *F. ovariana* or *ovarica* is one expressive of suffering from ovarian disease; the *facies uterina*, from uterine disease; the *F. cholerica* or *choleritica* is the drawn, pinched, sunken countenance produced by the great loss of fluids in the colliquative stage of Asiatic cholera. A cancerous facies, tuberculosis facies, hysterical facies and other varieties have been described, but most of them are fanciful.

FACILE, a. *făs′ĭl* [F. *facile*—from L. *făcĭlĭs*, easy: It. *facile*]: easily persuaded; flexible; yielding; not difficult. FACILITY, n. *fă-sĭl′ĭ-tĭ* [F. *facilité*—L.]: ease or readiness in performing; the means by which performance is rendered easy; dexterity; pliancy; readiness in compliance, in a bad sense. FACILENESS, n. *făs′ĭl-nĕs*, easiness to be persuaded or overcome. FACILITATE, v. *fă-sĭl′ĭ-tāt*, to make easy or less difficult; to lessen the labor of. FACIL′ITATING, imp. FACIL′ITATED, pp. FACIL′ITA′TION, n. *-tā′shŭn*. FACIL′-ITIES, n. plu. *-tĭz*, the means by which the doing is rendered easier; convenient advantages. FACILE PRINCEPS, phrase, *făs′ĭ-lē prĭn′sĕps* [L. easily first or best]: able to surpass all competitors without exertion.—SYN. of 'facility': ease; easiness; expertness; readiness; affability; condescension; complaisance; ductility.

FACIL′ITY, in the Legal Terminology of Scotland: condition of mental weakness short of that which will justify *Cognition* (q.v.), but which calls for the protection of the law through a process called Interdiction (q.v.), whose object is to prevent the facile person from granting deeds to his own prejudice. See FRAUD: LESION: INSANITY. There is no corresponding term in English law, or in that of the United States; but weakness of mind approaching to idiocy is an important element in proving fraud.

FACINOROUS, a. *fă-sĭn′ō-rŭs* [L. *facinorōsus*, criminal, vicious—from *facĭnus*, a crime]: in *OE.*, wicked; criminal; vicious.

FAC-SIMILE, n. *făk-sĭm′ĭ-lē* [L. *fac*, make; *factus*, made; *sĭmĭlĭs*, like]: an exact copy or likeness; an accurate imitation of an original.

FACT, n. *făkt* [L. *factum*, a thing done—from *facĕrĕ*, to do: F. *fait*, a fact]: anything which is done; an event; a deed; a reality; truth. IN FACT, in reality, as opposed to supposition. MATTER-OF-FACT, prosaic or material, as opposed to fanciful or poetical.—SYN. of 'fact': act; performance; incident; occurrence; circumstance; situation.

FACTION, n. *făk'shŭn* [F. *faction*—from L. *factĭōnĕm*, a making, a siding with any one—from *făcĕrĕ*, to make or do]: a party in turbulent or disloyal opposition; a cabal; dissension. FAC'TIONIST, n. one who acts unscrupulously in opposition. FAC'TIOUS, a. *-shŭs*, turbulent; pertaining to or given to faction. FAC'TIOUSLY, ad. *-lĭ*. FAC'TIOUSNESS, n. disposition to raise opposition on frivolous grounds.—SYN. of 'faction': combination; party; clique; junto; conspiracy; plot.

FACTITIOUS, a. *făk-tĭsh'ŭs* [L. *factĭtĭŭs*, made by art, artificial—from *făcĕrĕ*, to make: F. *factice:* Sp. *facticio*]: artificial; made by art; not natural. FACTI'TIOUSLY, ad. *-lĭ*. FACTI'TIOUSNESS, n.

FACTITIVE, a. *făk'tĭ-tĭv* [L. *factĭtŭs*, made or done frequently—from *factus*, made, done]: applied to a verb in which the action expressed produces some change in the object, as, 'He made the water wine.'

FACTOR, POWER: see ELECTRO DYNAMICS.

FACTOR, n. *făk'tėr* [L. *factor*, a maker or doer—from *facĕrĕ*, to make: F. *facteur*]: an agent employed by merchants or proprietors to do business for them, or sell their goods on commission; in *Scot.*, a land-steward; in arithmetic and algebra, a multiplier or multiplicand; one of the parts which are multiplied together to form a product. The numbers 6 and 4, multiplied together, *make* 24; hence 6 and 4 are called *factors* of the product 24. A product can be divided by any of its factors without a remainder; a factor, therefore, is often called a *divisor*, or measure; 2, 3, 4, 6, 8, 12, all are factors or divisors of 24. When a number is regarded as the product of two factors, each is called the *cofactor* of the other. Thus as regards the number 24, 6 is the cofactor of 4. Numbers that have no factor or divisor above unity, such as 2, 3, 5, 7, 11, . . . 23, etc., are called *Prime* Numbers. The resolution of a number into its prime factors can usually be accomplished only by trial. See NUMBERS, THEORY OF. The definition of a factor is the same in algebra as in arithmetic. Simple cases of factoring are given in the textbooks. Every polynomial of the *n*th degree has *n* factors of the first degree. Thus

$$x^n + a_1x^{n-1} + \ldots + a_n = (x - r_1)(x - r_2)\ldots(x - r_n)$$

Since a product cannot vanish unless one of the factors is 0, this leads to the fundamental law of algebra, that an equation of the *n*th degree has exactly *n* roots, r_1, $r_2 \ldots r_n$, the latter being either real or complex. Conversely if a polynomial vanishes for x = r, then x—r is a factor of it. Thus $x^3 - 2x + 1 = 0$ if $x = 1$, hence $x^3 - 2x + 1$ is divisible by $x - 1$. The *highest common factor* (*H.C.F.*), or greatest common divisor (*G.C.D.*) of any set of numbers or algebraic expressions is the product of all their common factors. The method of finding the H.C.F. is given in the textbooks.

FACTOR, in Commerce: in general one engaged to do

business for another. Factors and brokers are commercial agents employed to buy and sell for third parties, and usually paid by commissions on their transactions. To a factor the goods themselves, termed a 'consignment,' are intrusted for the purposes of a sale, while a broker, without taking possession or exercising control over the goods, negotiates sales or purchases of them. The term 'factor' is used comparatively seldom in the United States, that of 'commission merchant' being generally employed. The same person sometimes acts in the capacity of factor and broker, but in addition to the differences above noted, there are others. There is nothing to prevent the factor from buying and selling in his own name, but the broker is bound, unless otherwise authorized, to buy and sell in the name of his principal. The factor has a lien upon the goods for his advances and commission, but the broker has no lien. Neither factor nor broker has, in the absence of trade usage permitting it, the right to delegate his authority to anybody else unless authorized by the principal. When the factor, for an increased compensation, guarantees the payment of sales made by him, he is said to receive a *del credere* (borrowed from the Italian, and equivalent to guaranty or warranty) commission (see DEL CREDERE COMMISSION). When the factor resides in the same state or country as his principal, he is spoken of as a home or domestic factor, residing in a different state or country he is known as a foreign factor. A factor is generally authorized to sell on credit, but must be very vigilant that no loss occurs to the principal by reason of bad debts which care and attention might have prevented. As between himself and third parties, the factor is treated as the owner of the goods consigned to him. He has the right to insure such property, though ordinarily he is not bound to do so without agreement express or implied to that effect. A factor is required to keep the goods entrusted to him with the same care that he would use respecting his own.

Under the English common law, pledges of goods by a factor without authority from the principal were invalid. To modify this rule statutes have been enacted in England, viz. 6 Geo. IV. chapter 94 (1825) known as the Factor's Act, and 5 and 6 Victoria, chapter 39 (1842), and also in the United States, protecting persons, who, relying upon the factor's apparent ownership and possession of the goods, in good faith advance money to him thereupon. See AGENT: JUDICIAL FACTOR.

FAC'TORAGE, n. *-āj.*, the allowance or commission given to a factor. FAC'TORSHIP, n. the business of a factor. FACTORY, n. *făk'tėr-ĭ*, a place where goods are manufactured; the place where factors reside or keep their goods—applied to commerical stations abroad. FACTORIAL, a. *făk-tō'rĭ-ăl*, pertaining to a factory; an element in a computation; an agent in a result; the factorial of a number *n* is the product of all the numbers from 1 to *n;* it is usually denoted by *n!* FACTORIZE, v. *făk'tėr-īz*, in *law*, to warn not

to pay or give up goods; to attach the effects of a debtor in the hands of a third person.

FAC'TORY: establishment where large numbers of persons co-operate in the production of some article of consumption, the principle of the division of labor being in all cases applied, generally with machinery to a greater or less extent. The factory system is opposed to the practice of individual labor at the homes of the artisans. Every production of art requires a longer or shorter series of operations, often varying considerably in their nature. The hand-worker performs most of these himself; usually the same person begins and completes the article. In a factory, every article goes through as many hands or machines as there are separate processes required; each workman performs only one, and that always the same, process. The chief advantages of this way of proceeding are the following: Loss of time is avoided in passing from one operation to another, a loss which is the greater, the greater the difference in the nature of the operation. The workman, confined to one thing, in itself usually simple, not only learns it sooner, but attains a quickness and skill that one distracted with a variety of operations can never attain; besides, the constant occupation with one kind of work leads the workman to improvements in tools and machines which increase rapidity of execution and precision. As only few of the processes are very difficult, it is possible to turn to some account less skilful workmen, and even children, and to assign to each person that kind of work at which he is most effective. All parts of the work, too, that are quite uniform in the case of each article, can generally be done by machinery. Lastly, in factories, there is more opportunity of turning to advantage all kinds of refuse.

A necessary consequence of these advantages is that the cost of production is less on the factory system than in the other way; also, the articles themselves, when of a nature adapted to this mode of production, are better, and of a uniformity otherwise unattainable. Wherever a comparatively homogeneous material has to be made into a large number of uniform articles, there the factory system is in its proper place. The best examples are spinning, weaving, cloth-printing, pin and needle making, etc. But even in the manufacture of complex articles of different kinds of material, the factory system may be pursued with advantage whenever the number of the articles required is great, and the separate parts of such a kind that a great number can be made exactly alike. This is the case with watches, weapons, locks, etc. Such a manufacture divides itself into as many separate employments as there are parts in each article, and the putting together and adjusting (the 'assembling') forms another. The degree of complexity is carried still further in such cases as the manufacture of carriages, where operations of the most heterogeneous kind concur. In some cases, factories do not concern themselves with the putting together of the parts, but merely

produce them for hand-workers and special professionists, as in watch-making. In making clothes and shoes and the like, where each individual article requires special adaptation, factory work is not so entirely suitable. Nowhere have the factory system and the employment of machinery been carried further than in the United States; for instance, one establishment has produced 200 dozen chairs a week, another 1,000 bedsteads, most of the work being done by machinery; and one boot and shoe factory has used 600 bushels of shoe-pegs. Even the killing of pigs is done on this grand scale, one firm at Chicago killing and packing 373,725 hogs in four months.—Factories cannot succeed in great numbers except where the population is sufficiently dense to afford a choice of workers, and also—if there be sharp competition in the production—to prevent too high a rate of wages. Other conditions of a good locality for factory production are, abundance of water-power or the presence of coal for steam power, nearness to the raw material, and good communications.

While the rise and extension of the factory system, viewed from the point of material economics, must be pronounced a decided improvement, it cannot be denied that, socially and politically considered, it has its dark side. The greater the capital and the training necessary for carrying on an extensive establishment, the less prospect the workman has of raising himself to independence. The chasm that separates the mill owner from his dependants is far greater than that which exists between a master artisan and his journeymen. The hope of gradual advancement afforded in the last case supplies a powerful moral support and means of discipline; the impassable gulf in the other acts as a stumbling-block and temptation. Factory-workers are especially disposed to enter heedlessly into marriage, as they require to make no provision for a workshop, tools, and other outlay formerly necessary for entering life; while they have the prospect of the wife, and soon of the children, as contributors to the support of the family. It may, at all events, be affirmed, that the increase and accumulation in masses of the class called *proletaires*, who have no provision for a week but the labor of that week, is favored by the factory system. Moreover, the employment of wife and children as fellow-laborers endangers the bonds of the family; the father can no longer remain master of the house of which he is no longer the sole support; and how much the family affection is thus weakened is painfully exhibited in the ill-treatment of the younger children, who are prematurely put to labor. At the same time, these evils are not incapable of remedy; nor must it be forgotten that the evil is not peculiar to factory labor, but is a feature of the whole system of recent industrial economics. The very circumstances that give rise to the evils, afford the means of obviating them, if they were only taken advantage of; for, the larger the establishment, the more good can an owner do for his people, and the less it is possible to conceal abuses.

FACTORY ACTS.

FACTORY ACTS: laws in the interest of workers in factories. The development of the textile industries toward the end of the 18th c., in England, led to the employment of a great many children, sent by the Poor Law authorities from the southern agricultural counties to the districts of Derbyshire, Nottinghamshire, and Lancashire. These children were ill looked after, and the mills generally overcrowded. In 1802, the Morals and Health Act was passed. The introduction of steam led to the Cotton Mills Act, 1819, which fixed the working age of children at nine years, and the working week for them at 72 hours. The Saturday half-holiday did not come until Sir John Hobhouse's Act of 1825. Richard Oastler, the 'Factory King,' was then spreading through the woolen districts of Yorkshire the agitation for the Ten Hours Bill. The Cotton Industry Act, 1831, may be called the first Factory Act, but it was carried out very imperfectly, the men often being compelled to support a fund, out of which the employers' fines were paid. Tom Sadler's Ten Hours Bill, 1832, was lost through the opposition of the manufacturers; and Lord Ashley's Bill, which restricted the working hours of adults, was met by the appointment of a royal commission (1833–4), whose report took the view of the capitalists, that such a restriction would so diminish production as to put them at the mercy of foreign competition. On its recommendations was based Lord Althorp's Act (3 and 4 Will. IV. c. 103), which first made the distinction between children and young persons, and began the system of working children in relays, so as to permit daily education. A singular division of political parties took place on the factory question at this time; the chartists and the conservative protectionists favoring the demands of the artisan class against the whig capitalists and the Anti-Corn-Law League. The first fruit of Lord Ashley's Children Employment Commission was the Mining Act, 5 and 6 Vict. c. 99, which prohibited work underground to women and boys under ten years of age. The alternate day system (with an extension of the hours for schooling) was further developed in the important Factory Act, 1844. A uniform working day, from 6 A.M. to 6 P.M., with a fixed 1½ hour for meals, was at last established for all protected persons by the act 13 and 14 Vict. c. 54. The children's working day was still regulated by the act of 1844; and as this interfered with education under the 'alternate day' system, the anomaly was removed by the act 16 and 17 Vict. c. 104. Manual work had been diminishing in many trades; and in 1861 several restrictions were placed on lace factories and on bake-houses. The next general movement, however, was entirely due to the great Commission of Inquiry, the appointment of which Lord Shaftesbury moved 1861. Their recommendations were well received by the employers, who were now more alive to the advantages connected with sound sanitary conditions for labor. In 1876 the Royal Commission on Factory and Workshop Acts reported that previous legislation had been to a large

extent successful; and that, while some occupations were still undoubtedly unhealthful in spite of the sanitary regulations of these acts, the cases in which young children were employed in labor unfitted for their years, or in which young persons and women suffered physically from overwork, had become uncommon. The commissioners, however, proposed large changes in the law, and in particular they proposed the consolidation of the law, then dispersed through 15 statutes—one passed 1802, requiring all apprentices in cotton and woolen factories to be instructed in the principles of the Christian religion. This consolidation has been accomplished by the Factory and Workshop Act, 1878, 41 Vict. c. 16, which deals with five classes of works: (1) Textile factories, which remain very much under the regulations enacted by the Factory Acts of 1844, 1861, and 1874: (2) Non-textile factories, which include the occupations enumerated in the Factory Acts Extension Act, 1864, and the Workshops Act, 1867, whether using mechanical power or not, and also all occupations, not named in these acts, in which mechanical power is used: (3) Workshops, or all unnamed occupations, in which mechanical power is not used, except those named in the acts of 1864 and 1867: (4) Workshops in which none but women above the age of 18 are employed: (5) Domestic workshops, in which the work is carried on in a private house, room, or place in which the only persons employed are members of the same family dwelling there. In class (1), where power is used, and the large majority of workers are women and children, the highest degree of regulation is reached. In class (2), where the labor is not so hard, or the strain of attendance on the moving power not so heavy, the statutory hours of work are somewhat relaxed, but education and sanitary provisions are still compulsory. In class (3) registers of children and young persons, and certificates of age and fitness, are, except in special circumstances, dispensed with. In class (4), the hours for work and meals may be changed, and the sanitary authority is responsible for the sanitary state of the shop. In class (5), there is still greater elasticity as regards hours for work and meals; the medical officer of health inspects the sanitary condition, but the employment of women is entirely unrestricted. A place used solely as a dwelling, a part of a factory used solely for some purpose different from the process carried on in the factory, and a school, are not considered workshops or factories. Straw-plaiting, pillow lace-making, glove-making, and some other handicrafts of a light character, may be carried on by a family in a private house or room, without fixing on the premises the legal liability of a workshop. Again, if the manual labor is exercised only at irregular intervals, and does not furnish the principal means of living to the family, the house will not become a workshop. The act does not apply to persons engaged merely to repair machinery in a factory.

In considering the main provisions of the Act of 1878, it must be kept in view that a 'factory' means a place in

which machinery is moved by the aid of steam, water or other mechanical power; a 'child' means a person under the age of 14 years; a 'young person' means a person between 14 and 18 years of age; a 'woman' means a woman of 18 years and upward; 'parent' includes the person having the custody or control of any child; 'night' means the period between 9 P.M. and 6 A.M. The general *sanitary provision* applicable to all factories and workshops is, that they shall be clean, free from effluvia, not overcrowded, and ventilated so as to render harmless, so far as practicable, the injurious gases, vapors, dust, etc., generated in the process. Where anything is wrong, the factory inspector gives notice to the sanitary (local) authority. Every factory is to be lime-washed once in 14 months, unless painted in oil once in 7 years, when it must be washed once in 14 months. The inspector may order fans to be used where dust is generated by grinding, glazing, or polishing on a wheel. Special provision is made for the painting of bakehouses, and for the protection of workers in the wet-spinning process. The obligation to fence factory machinery in an efficient manner applies to every hoist or teagle near to which any person is liable to be employed, every fly-wheel connected with mechanical power, every part of a steam-engine and water-wheel, and every wheel-race. The inspector may also require the fencing of any driving strap, or band, or other part of machinery which he considers dangerous, or of any vat, pan, or other structure filled with hot liquid or molten metal so as to be a likely source of danger to the protected classes. Children must not be set to clean any part of the machinery while in motion; as regards young persons and women, the prohibition extends only to mill-gearing. No work is to be done between the fixed and traversing parts of a self-acting machine while moved by mechanical power. The general rules for hours of employment of young persons and women in the textile factories are 6 A.M. to 6 P.M., or 7 A.M. to 7 P.M., except on Saturdays, and on Saturdays 6 A.M. to 12.30 or 1 P.M. (according to the time allowed for meals), or 7 A.M. to 1.30 P.M. Two hours (one of them before 3 P.M.) must be allowed for meals on every day except Saturday, on which half an hour is sufficient. The employment is not to be continuous more than 4½ hours without an interval of half an hour for meals. The variations on these rules for young persons and women in a non-textile factory, and for young persons in a workshop, are that the minimum time for meals is reduced to 1½ hours, and the period of continuous employment is extended to 5 hours. As regards children in textile factories, they must be employed on the system of morning and afternoon sets, or on that of alternate days. Their morning set ends at 1 P.M., or dinner-time, if that is earlier; the afternoon set begins at 1 P.M., or after dinner, if that is later. The Saturday hours for children are the same as for others. Neither set is to be continued more than seven days, and no child may be employed on two successive Saturdays.

Under the alternate day system, the hours for employment and meals are the same as for young persons. In workshops in which neither children nor young persons are employed, the hours for women are 6 A.M. to 9 P.M., with $4\frac{1}{2}$ hours for meals and absence for work; and on Saturdays, 6 A.M. to 4 P.M., with $2\frac{1}{2}$ hours for these purposes. As regards *domestic* workshops, the most important specialty is that the alternate system for children may not be used. The actual times for work and meals are not fixed, but overtime is prohibited, and the shops are under the sanitary supervision of the local authority. The two points fixed by statute with reference to meals in factories and workshops generally are: That the three classes of children, young persons, and women must have their meals at the same hour; that during that hour none of them is allowed to remain in a room where the manufacturing process is being carried on. In every factory and workshop the period of employment, prohibitions, meal hours, and system of children's labor, all must be published in a notice put up within the premises. Employment of children under the age of ten, and of any of the protected classes on Sunday, is prohibited. The occupier is also bound to give eight half-holidays in every year besides (in Scotland) the sacramental fasts. In trades carried on in connection with the retail business, the home secretary may authorize the giving of separate holidays to different classes of workers; and in other cases (e.g. in provincial towns where Saturday is the market day) he may substitute another week-day for the Saturday half-holiday. A child employed on the morning and afternoon set must give one school attendance on each work day, and, if employed on the alternate day system, two school attendances on each non-working day. The penalty is that the child cannot be employed in the following week before the deficiency in school attendance has been made up. It is the duty of the employer to get every week from the teacher a certificate of attendance. He may also be obliged to pay to the school-manager a sum not exceeding 3*d*. a week, or one-twelfth part of the child's weekly wages. A child of 13 years, however, on obtaining a certificate of proficiency, will be treated as a young person. No child or young person under the age of 16, is to be employed in a factory more than seven days without a certificate of age and physical fitness granted after personal examination by the medical officer or certifying surgeon of the district. When an accident occurs in a factory or workshop which causes loss of life, or prevents the person injured resuming work within 48 hours, notice must be given to the inspector and the medical officer or certifying surgeon, the latter of whom must go at once to the premises and report to the inspector on the nature and cause of the death or injury.

The Act imposes numerous special restrictions. For instance, no children or young persons are allowed to work at silvering mirrors by the mercurial process, making white lead, melting or annealing glass. Children must not be

employed in dipping lucifer matches, or dry grinding in the metal trade. Girls must not be employed in making or finishing bricks or salt. In glass and earthen ware works and others, certain parts of the works must not be used for taking meals. The home secretary has power to extend such restrictions to other unwholesome occupations. Again, where the customs and exigencies of a trade require it, the home secretary may alter the hours of labor to 8 A.M. and 8 P.M., or even 9 A.M. and 9 P.M. Of the first class, lithographic printing, envelope making, biscuit making, and bookbinding are examples; of the second, the straw-hat making at Luton and warehouses in London and elsewhere. The administration of the Act is carried on by inspectors, appointed and paid by government. They have large powers of entering factories, workshops, and schools, of asking for documents, of examining persons on oath. A special warrant is required to enter a dwelling-house. The inspectors report to government annually. The certifying surgeons appointed by the inspectors are entitled to charge for their statutory duties certain fees, which are paid by the employer, but which he may deduct from wages.

Laws in the United States for Protection of Factory Operatives.—In the earlier years of the factory in the United States, each home had its spindles and loom to fill the needs of its own members, the flax and cotton being grown, spun, and wove by the individual householder, or the slaves on the plantations. England frowned upon all manufactures in her colonies, and would allow no machinery or parts of machinery to be brought to this country, but could not fetter the brain, nor forbid the inventive genius, and Slatter and his associates, who coming to this country in the latter part of 1700, brought with them the knowledge which in 1803 built in Massachusetts the first cotton-mill in America. The first mill to take cotton in its crude state and pass it through the different processes to the woven cloth, was erected in Waltham, Mass., in 1813. The first type foundry was built in Philadelphia in 1794. The first glass-house was constructed in Pittsburg in 1796. Other factories followed in rapid succession between 1796 and 1810.

The first factory inspection law was adopted in England about the beginning of the 19th century, as a result of the agitation caused by epidemics among children and women in factories, but it was not until 1819 that the law was made effective. The abuses became so great that the government was at last compelled to interfere in the interests of humanity. This began by asserting the right of the state to control industrial establishments, where women and children were employed, but this necessarily involved the freedom of men in making contracts. The law was intended more particularly to meet the evils of the apprentice system, but it did not extend to factories, where children residing in the neighborhood were employed. From time to time this act has been amended, and the authority of

government extended, so as to make it generally effective for the protection of all labor. It was thus in England that the value of factory inspection was first determined by experience. Subsequently it was introduced into this country. Massachusetts was the first American State to adopt a law of that character.

To-day there are factory laws in the United States based on the Massachusetts laws, for the examination and approval of plans of factories, apartment and tenement houses, also for proper fire-fighting, means of egress, and sanitary provisions; regulating the employment of labor of women and minors in manufacturing, mechanical and mercantile establishments and workshops; guarding of machinery; the construction of safety appliances of elevators; ventilation of factories and workshops; provision of water-closets for the use of each sex employed in factories and workshops, and various other sanitary regulations; uniform hours for meals for women and young persons; communication between the engineer's room and each room where machinery is run by steam; proper safeguards at hatchways, elevator openings and well-holes in public buildings, factories and mercantile establishments; competent watchmen and red lights in hotels; prohibiting during working hours the locking of any inside or outside door of any building where operatives are employed; weekly payment of wages; and sundry other matters; the granting of licenses to make, alter, repair, or finish coats, vests, trousers or wearing apparel of any description in a room or apartment in a tenement or dwelling house; the examination of engineers and firemen, and the inspection of boilers, granting of licenses, and steam power to be used. Women are protected by law from overwork by their employers and children are excluded from factories until of proper age, and Massachusetts has been from the first, and continues to be, in the advance in factory inspection, and under this system her industrial establishments have become models for all the other States. It is a marked illustration of what such a law accomplishes for a community.

FACTOTUM, n. *făk-tō′tŭm* [L. *fac*, do; *tōtŭm*, the whole]: one who does all kinds of work, a humble friend or confidential servant who is ready to do any kind of work.

FACULÆ, n. plu. *făk′ū-lē* [L. *facŭlă*, a little torch: It. *facola*]: spots seen sometimes on the sun's disk, which appear brighter than the rest of its surface: see SUN.

FAC′ULTIES, COURT OF: established in the reign of Henry VIII., in England, by acts giving authority to the Abp. of Canterbury and his successors to grant dispensations, faculties, etc., by himself or his sufficient and substantial commissary or deputy, for any such matters not being repugnant to the Holy Scriptures and the laws of God, such dispensations, etc., as had formerly been accustomed to be had at the see of Rome. Up to the time of passing this act, the pope, notwithstanding the statutes

which had been passed restraining his authority, continued to exercise his power, and to draw a considerable revenue for indulgences, etc. The chief officer of the court is called *magister ad facultates*. The sittings of the court have always been held at Doctors Commons (q.v.). On its first institution, there were various matters in which the dispensing power was called into exercise—such as the power to hold two or more livings (see PLURALISM), and the permission to eat flesh in Lent, etc. But of late years the matter which has chiefly occupied the court has been the granting license to marry without publication of banns. See LICENSE; MARRIAGE; DISPENSATION.

FACULTY, n. *făk'ŭl-tĭ* [F. *faculté*—from L. *facŭltātĕm*, capability, power—from *făcĭlĭs*, easy. It. *facolta*]: the power of doing anything; a power or capacity of the mind; ability; skill derived from practice; the professors in a college, or of a department in a university (see COLLEGE: UNIVERSITY): an ecclesiastical dispensation. THE FACULTY, the medical profession. FACULTY OF ADVOCATES, in *Scot.*, the members of the bar, taken collectively (see ADVOCATES) FAC'ULTIES, n. plu. *-tĭz*, powers of the mind, especially of the intellect. Reid considered that the characteristic of a faculty was its *primitive* character, as opposed to the acquired powers, or habits. Sir W. Hamilton remarks on this distinction as follow: 'Powers are *active* and *passive*, *natural* and *acquired*. Powers natural and active are called *faculties*. Powers natural and passive *capacties* or *receptivities*. Powers acquired are habits, and habit is used both in an active and a passive sense.' Hence, in discussing the intellect, whatever are considered its primary or fundamental functions are its faculties. Perception, Memory, Reasoning, Imagination, are the principal intellectual faculties according to the older metaphysicians, who followed the popular classification. These would not now be considered as giving the ultimate analysis of the intellect. Conscience, or the moral sense, has sometimes been called the *moral* faculty: see INTELLECT.—SYN. of 'faculty': power; talent; gift; endowment; dexterity; adroitness; knack; capacity; privilege; authority; license; dispensation.

FAC'ULTY, GRANT OF BY THE ORDINARY, in the Church of England: order by the bishop of a diocese to award some privilege not permitted by common law. A faculty is necessary in order to effect any important alteration in a church, such as the erection of a gallery or of an organ. Without a faculty, a person is not entitled to erect a monument within the walls of a church. But a monument having been put up, though without a faculty, cannot be removed till a faculty or order to that effect has been obtained. By the common law of England, every parishioner is entitled to a seat in church, but no one has a claim to any particular seat, unless the right has been given by a faculty: see PEWS.

FAD, n. *făd* [colloq., etym. doubtful]: a crotchet; a hobby; a favorite theory or idea.

FADDLE, v. *făd'l* [imitative of rapid movements: Gael. *fadal*, tedious]: to trifle; to toy. FID'DLE-FAD'DLE, n. idle or purposeless action or talk.

FADE, v. *fād* [Dut. *vadden*, to wither—from Sw. *fladra*, to flutter: F. *fade*, insipid, dull]: to decay or wither; to droop; to lose lustre, color, or freshness; to cause to wither; to lose strength; to vanish. FA'DING, imp.: ADJ. subject to decay, liable to lose freshness and vigor; not durable: N. in *OE.*, a kind of ending to a song. FA'DED, pp.: ADJ. become less vivid in color; withered. FADE'LESS, a. that cannot fade. FA'DINGLY, ad. *-lĭ*. FA'DINGNESS, n.

FADGE, v. *făj* [AS. *gefégan*, to join: Gael. *faigean*, a sheath: Dut. *voegen;* Ger. *fügen*, to become, to suit with]: in *OE.*, to suit; to fit; to answer; the purpose intended FADG'ING, imp. FADGED, pp. *făjd*.

FAEBERRY: same as FAYBERRY.

FÆCES, n. plu. *fē'sēz* [L. *fæcēs*, dregs or sediment]: solid excrement; sediment or settlings. FÆ'CAL, a. *-kăl*, relating to excrement.—*Fæces* are matters which an animal ejects from the lower end of the intestinal canal; in greater part consisting of those portions of food which, on passing through the alimentary canal, have been rejected as comparatively worthless in the office of nutrition. In the higher animals, fæces generally contain about three-fourths of their weight of water, the remaining one-fourth consisting, in greater part, of organic remains; in the case of the ox, sheep, and other herbivorous animals, of undigested woody fibre. In the human subject, the quantity of fæces yielded daily by an average healthy man is 5 to 6 ounces; the peculiar brown color is due to the presence of decomposing biliary matter, and the odor to partially changed nitrogenous substances. The following table gives the composition of human and ox fæces:

Human.		Ox.	
Water,	73·3	Water,	70·00
Organic remains,	7·0	Woody fibre,	22·50
Biliary and nitrogenous matter,	14·9	Wax,	0·76
Albumen,	0·9	Sugar,	3·00
Extract,	2·7	Albumen,	2·00
Salts,	1·2	Resin and Salts.	1·74

For use as manure, these fæces are of little value as compared with guano, dissolved bones, or superphosphates, and, indeed, the principal effete matters of importance to the agriculturist are resident in the urine or liquid excrement of the higher animals. In the case, however, of birds and reptiles, the urine and fæces are voided together more or less moist, and hence the richness of such excrementitious matter, and its high agricultural value: see GUANO.

FÆCULA, n. *fĕk'ū-lă*, FÆCULENT, FÆCULENCE: see under FECULA.

FAED, *fād*, JOHN: Scottish painter: b. 1820, at Burley Mill, in the stewartry of Kirkcudbright, where his father

was an engineer and millwright; d. Gatehouse-of-Fleet, Scotland, 1902, Oct. 22. When but just entered on his teens, he was in the habit of making tours through the villages of Galloway, painting miniatures. In 1841, he came to Edinburgh, where his talents ultimately won high reputation. His first picture that obtained great popularity was *The Cruel Sisters* (1851). He afterwards executed, among other works. *Shakspeare and his Contemporaries*; *The Cotter's Saturday Night*; *The Soldier's Return*; *The Wappenschaw*; *The Old Style*; *Tam o' Shanter*; *Haddon Hall of Old*; *The Stirrup Cup*; *John Anderson my Jo*; *The Gamekeeper's Daughter*; *The Hiring Fair*; *The Philosopher* (1855); *The Houschold Gods in Danger* (1856); *Job and his Friends* (1858); *Boaz and Ruth* (1860); *Catherine Seyton* (1864); *After the Victory* (1873); *The Morning before Flodden* (1874); *Blenheim* (1875); *In Memoriam* (1876); *The Old Basket-Maker* (1878); and *The Poet's Dream* (1882).

FAED, Thomas: Scottish painter: b. Burley Mill, Kirkcudbrightshire, 1826, June 8; d. London, 1900, Aug. 22. One of his earliest efforts was a drawing (water colors) from the *Old English Baron*. In 1849, he became an assoc. of the Royal Scottish Acad., and soon afterward executed a very attractive work, *Scott and his Friends at Abbotsford*. In 1852, he removed to London, where his *Mitherless Bairn*, 1855, was declared by the critics, 'the picture of the season.' Among his subsequent works are *Home and the Homeless*; *The First Break in the Family*; *Sunday in the Backwoods*; *From Dawn to Sunset*; *Baith Faither and Mither*; *The Last o' the Clan*; *Pot Luck* (1866); *Worn Out* (1868); *Homeless* (1869); *The Highland Mother* (1870); *Winter* (1872); *Violets and Primroses* (1874); *She Never Told her Love* (1876); and *Maggie and her Friends* (1878). Faed was made A.R.A., 1859, R.A., 1864, and elected an honorary member of the Vienna Royal Acad. in 1875.

FAENZA, *fâ-ĕn'zâ:* town of Italy, 20 m. s.w. of Ravenna, on the left bank of the Lamone, in a beautiful plain. It is in the form of a square divided by four great streets, which meet in the centre. Among the chief buildings are an imposing cathedral, a fine market-place surrounded with arcades and adorned with a fountain, and numerous palaces and ecclesiastical edifices. Its manufacture of glazed and colored earthenware vessels, in Italy called 'Majolica,' and in France 'Faience' (q.v.), has declined in importance, and its chief industry now is the making of silk, linen, and paper. Faenza, anc. *Faventia*, was at one period a town of the Boii, afterward a *municipium* under the Romans, and was annexed to the States of the Church in the 15th c. by Pope Alexander VI., in which condition it remained still 1860, when, with the Emilian provinces, it was annexed to the kingdom of Italy under Victor Emmanuel.—Pop. (1901) 39,757.

FÆSULÆ: see Fiesole.

FAERY: see Fairy.

FAG, v. *făg* [from *flag*, to become flaccid, to be weary: comp. Gael. *faigh*, to get, to obtain]: to work hard and slavishly; to make a drudge of any one; to become weary; to tire out; to fail in strength: N. a hard worker under another; a schoolboy who is the forced drudge of an elder pupil. FAG'GING, imp.: N. laborious drudgery. FAGGED, pp. *-făgd*. FAG-END [the *lag-end*, the end which *flags* or hangs loose]: the remnant of cloth; the refuse or inferior part of anything; the untwisted end of a rope. To FAG OUT, to untwist; to loose.

FAGIN, or FAGINE, n. *fā'jĭn* [L. *fagus*, a beech]: in *chem.*, the name given to a narcotic substance obtained from the nuts of the *Fagus sylvatica*, or common beech. It is a yellow mass, of a sweetish taste, easily soluble in water and alcohol, and sparingly in ether.

FAGOPYRUM: see BUCKWHEAT.

FAGOT, n. *făg'ŏt* [F. *fagot;* It. *fagotto;* W. *ffagod*, a fagot —from W. *ffassgu*, to bind, to tie: comp. Gael. *fag*, to leave, that which is left]: a bundle of sticks bound together for use, as fuel, etc.; a term of opprobrium or reproach among the lower classes to children and women; an old shrivelled woman: V. to form into fagots: ADJ. *Brit.* nominal; fictitious, as a soldier numbered in the muster-roll, but not really existing, applied to the vote of a non-resident elector—now usually restricted to a vote on a qualification created to promote party purposes. FAG'OTING, imp. FAG'OTED, pp.

FAGOTTO, n. *fa gŏt'tō* [It.]: the Italian name for the bassoon, by which it is generally known in instrumental scores. The name is said to be derived from its resemblance to a fagot or bundle of sticks.

FAGS, n. *făgz* [etym. doubtful]: a disease in sheep.

FAGUS: see BEACH.

FAHL ORE: a complex ore found in different parts of the world. It consists of the sulphides of antimony, iron, zinc, copper, arsenic, mercury, bismuth, silver and sometimes of other metals, in very variable proportion. It is largely worked for these metals by a rather complicated process, the details of which differ according to the exact composition of the ore in question. In general, the volatile materials, sulphur, arsenic, antimony and mercury are burnt off and volatilized by roasting in a current of air. The zinc and silver are removed by means of lead and the iron and copper separated by smelting with a suitable flux.

FAHRENHEIT, *făr'ĕn-hīt or fâr'ĕn-hīt*, GABRIEL DANIEL: 1686, May 14—1736, Sep. 16; b. Dantzig: improver of the thermometer and barometer. Having travelled through Germany and England, enlarging his scientific knowledge, he settled in Holland. In 1720, he conceived the idea of using quicksilver instead of spirits of wine in thermometers, by which the accuracy of the instrument was much improved: see THERMOMETER. In 1724 Fahrenheit was elected a fellow of the Royal Soc.

of London; and the *Philosophical Transactions* of that year contain several papers by him.—On the Fahrenheit thermometer scale, the freezing-point of water is marked 32°, and the boiling-point 212°.

FAIDHERBE, *fā-dĕrb′*, Louis Léon César: French general: b. Lille, 1818, June 3; d. 1889, Sep. 28. He was educated in the Polytechnic School, performed his first military service in Africa, became gov. of Senegal 1854, gen. of div. 1870; and commanded the army of the north in a number of engagements with the Prussians 1870, Dec. —1871, Jan. On 1871, Jan. 19, he was defeated by Gen. von Goeben at St. Quentin, owing to his lack of artillery and the inexperience of his army. He was a warm Gambettist, became a member of the national assembly, retired from political life on the triumph of Thiers's govt., and was appointed grand chancellor of the Legion of Honor. He published numerous scientific papers in the *Annuaire du Sénégal* (1859, 60, 61); and in the *Bulletin de la Société de Géographie*, of *Chapitre de Géographie sur le Nord-Ouest de l'Afrique* (1864); *Collection compléte des Inscriptions Numidiques* (1870); and *Campagne de l'Armée du Nord* (1871). He was noted as a milit. organizer, geographer, ethnographist, and linguist.

FAIENCE, n. *fă-yăngs′* [F. *faïence*—said to be from *Faenza*, in Italy, where first made]: general term for all sorts of glazed earthenware and porcelain; but applied specially to a rich painted kind. The origin of the name is disputed. Some derive it from Fayence, a small town of Provence, others from Faenza, a city of Italy; while certain writers consider that the isle of Majorca is at least the place where it was originally manufactured, in proof of which they appeal to the fact, that the Italians still call Faience *Majolica or Mayolina*.

FAI-FO, *fī′fō:* seaport of Anam (q.v.); one of the more considerable marts of the empire. It stands on a river near its mouth, communicating with Turon, 15 m. n. by a canal. It exports sugar and cinnamon, its principal trade being with China. Pop., mostly Buddhists, 15,000.

FAIL, v. *fāl* [F. *faillir*, to err, to fail—from L. *fallĕrĕ*, to deceive: W. *ffaelu*, to fail: Ger. *fehlen*, to miss: Dut. *fœlen*, to slip: comp. Gael. *feall*, to deceive, to betray]: to neglect to aid or supply; to disappoint; to fall short; to become deficient; to decay or decline; not to succeed in a design; to be entirely wanting; to become weaker; to desert; to become bankrupt; in *OE.*, to deceive: N. omission; nonperformance. Fail′ing, imp.: N. a fault; a weakness; an imperfection or defect. Failed, pp. *fāld*. Fail′ingly, ad. *-lĭ*. Failure, n. *fāl′ŭr*, an unsuccessful attempt; deficiency; omission; total defect; decay; insolvency.—Syn. of 'failing, n.': failure; frailty; foible; infirmity; fault; deficiency; lapse; omission; non-performance; decay; defect.

FAIL, a. *fāl* [Gael. *fal*, a pen-fold, a hedge]: in *Scot.*, applied to a dike or wall of turf.

FAILLE, n. *fāl* [F.]: a soft, inexpensive silk material used for evening dresses, and for trimmings of hats, etc.

FAILLIS, n. *fāl'ĭs* [F.]: in *her.*, a failure or fracture in an ordinary, as if it were broken, or a splinter taken from it.

FAIN, a. *fān* [OF. *fain*, for *faim*, hunger, vehement desire—from L. *fămēs*, hunger: Icel. *feginn*, glad: comp. Gael. *fan*, prone]: glad to do; eager; obliged or compelled; in *OE.*, joyful; glad: AD. gladly. FAIN'NESS, n. state of being fain or desirous to do. FAIN'ING, a. in *OE.*, expressive of desire.

FAINÉANTS ROIS, *fā-nā-âng rwâ* [Fr. 'Do-nothing Kings']: sarcastic designation of the later Merovingian sovereigns of France, under whose name the famous Mayors of the Palace really governed the country. The first of the F. R. was Thierry III., nominally monarch of Burgundy, Neustria, and Austrasia the others were Clovis III., Childebert III., Dagobert III., Chilpéric II., Thierry IV., and Childéric III. The last of those was dethroned in 730, and was shut up in a monastery, and Pepin *le Bref*, Mayor of the Palace, caused himself to be formally proclaimed king. This was the end of the Merovingian dynasty; it is curious that Louis V., last of the Carlovingians, descendant of Pepin *le Bref*, also received the contemptuous epithet of *Fainéant* as those monarchs had who were dethroned by his ancestors.

FAINT, a. *fānt* [OF. *feint*, feigned; F. *vain*—from L. *vānus*, empty, feeble: W. and Bret. *gwan;* Gael. *fann*, weak, faint]: weak; exhausted; inclined to swoon; not bright, as a color; not loud; timorous; cowardly; slight or imperfect, as a faint resemblance, a faint smell; feeble, as a faint resistance: V. to waste away quickly; to swoon; to be weak; to become weary; to become senseless and motionless; to sink into dejection; to lose courage; in *OE.*, to cause to faint. FAINT'ING, imp.: ADJ. languishing; sinking: N. temporary loss of motion and sensation. FAINT'ED, pp. FAINT'INGLY, ad. *-lĭ*. FAINT'ISH, a. somewhat faint. FAINT'ISHNESS, n. state of being somewhat faint. FAINTLY, ad. *-lĭ*. FAINT'NESS, n. feebleness; want of strength. FAINT-HEARTED, a. *-hârt'ĕd*, yielding to fear; dejected; timorous. FAINT-HEART'EDLY, ad. *-lĭ*. FAINT'HEART'EDNESS, n. FAINTS, n. plu. *fānts*, the impure spirit which comes over first and last in the distillation of whisky; the weak or impure remains of the whisky-still.

FAINT'ING, or SYN'COPE: condition in which, in consequence of a sudden mental or bodily shock, the circulation of blood is temporarily arrested or very much diminished in force and volume, the respiration and the functions of the nervous system likewise being suspended. The indications of fainting to a bystander are chiefly a sudden pallor, accompanied by loss of power over the limbs, with disappearance of the pulse and unconsciousness; the eyes are commonly half open or closed, the countenance bloodless, but quite at rest, and not indicative of suffering or

disturbance; the flaccid, motionless condition of all the limbs also tends to distinguish simple fainting from epilepsy and the other diseases attended with spasm; while the vanishing of the color, and the suppression of the pulse, make a marked distinction between fainting and catalepsy (q.v.), and other forms of hysteria (q.v); with which disorders, however, fainting may in some cases be associated. The mode of origin of fainting, and the study of its phenomena, alike lead to the conclusion that it is primarily an impression upon the nervous system; this reacts, in the first instance, on the heart, and through the circulation on all the other functions of the body. Fainting may end in death, if too prolonged, or if associated with disease of the internal organs; especially of the heart. See HEART, DISEASES OF THE. Ordinarily, a person who faints from mental emotion, a hot and close atmosphere, or other transient cause, is readily restored by being laid on the back with the head low, and surrounded by abundance of cool fresh air. Any tight articles of dress should be loosened, and a stream of cold air, or a little cold water, should be directed to the face and neck, so as to rouse the respiratory movements. It is common, also, to apply ammonia or aromatic vinegar to the nostrils in order to increase the depth of the respirations and to arouse the heart to action. Care should be taken to ascertain that there is no obstruction in the throat or air-passages, as suffocation from mechanical causes has been mistaken for fainting, and the real origin of the mischief overlooked, with fatal consequences. Should all other means fail, galvanism will sometimes succeed in restoring the respiration and heart's action.

FAIOUM′: see FAYUM.

FAIR, a. *fär* [Icel. *fagr* bright: AS. *fæger*, beautiful: Gael. *fair*, the rising or setting of the sun]: beautiful; free from any dark hue; white; spotless; favorable; fine, as weather; prosperous; frank; civil; just; equitable; used in a slightly depreciatory sense, as *a fair copy*—that is, one not *particularly good:* N. the female sex; in *OE.*, for 'fairness': AD. openly. FAIR′LY, ad. justly; good in some degree; completely. FAIR′NESS, n. the quality of being fair; equity; freedom from spots or blemishes; beauty; candor; freedom from disguise. FAIR′ISH, a. *-ĭsh*, reasonably or moderately fair. FAIR′ISHLY, ad. *-lĭ*. THE FAIR SEX, the female sex. A FAIR FIELD, open space for action or operation; freedom from obstructions. FAIR-FOLK, or FARE-FOLK, n. *-fōk*, the fairies: see FAIRY. FAIR-SPOKEN, bland; civil; courteous. FAIR-GRASS, n. in *bot.*, *Potentilla anserina; Ranunculus bulbosus.* FAIR-HAIR, n. [Sc.]: the tendon of the neck of cattle or sheep. FAIR-HAIRED, having light hair. FAIR-LEAD, n. in *naut.*, a term applied to ropes as suffering the least friction in a block, when they are said to lead fair. FAIR-LEADER, n. in *naut.*, thimble or cringle to guide a rope; a strip of wood with holes in it, for running rigging to lead through. FAIR-LEATHER, n. *-lĕth′ėr*,

leather finished in the natural color or that imparted by the tanning process; free from any special coloring. FAIRWAY, n. the navigable part of a river. TO BID FAIR, to be likely. TO KEEP FAIR, to be on good terms. TO SPEAK FAIR, to address with courtesy and frankness. FAIR PLAY, just and impartial treatment. FAIR-MAIDS OF FEBRUARY, n. in *bot.*, *Galanthus nivalis*, alluding to the blossoming of the snowdrop about February 2, or Candlemas Day. FAIR-MAIDS OF FRANCE, n. in *bot.*, *Saxifraga granulata; Achillea Ptarmica; Ranunculus aconitifolius; Lychnis Flos-cuculi.* FAIR-MAIDS OF KENT, n. in *bot.*, the double-flowered variety of *Ranunculus aconitifolius.* *Note.*—In the sense of 'equitable, just,' FAIR may be connected with Gael. *firean*, righteous, just; *fearr*, better, best.—SYN. of 'fair, a.': reasonable; moderate; middling; candid; open; ingenuous; clear; honest; direct; impartial; unblemished; handsome; cloudless; propitious; favorable; upright; pleasing; distinct; legible.

FAIR, n. *fär* [F. *foire;* It. *feria*, a market held on a holiday—from L. *ferīæ*, holidays: comp. Gael. *foir*, a crowd of people; *faidhir*, a market]: a market held at stated periods (see FAIRS). FAIRING, n. *fär'ĭng*, a present bought at a fair.

FAIR, or BENMORE', HEAD: promontory of the n. coast of Antrim, Ireland, opposite Rathlin Isle, which is four m. to the n. west. It rises 636 ft. above the sea. The lower 300 ft. consists of carboniferous strata, overlaid by green-stone columns, 20 to 30 ft. thick, and 280 to 300 ft. high. It is perpendicular to the sea, but slopes to the land. The table-land on the top is covered with rich pasture, and presents fine views of the neighboring coast, Rathlin Isle; and the Argyleshire Highlands, 16 m. distant. On the promontory are two small lochs, 500 ft. above the sea.

FAIRBAIRN, *fär'bärn*, ANDREW MARTIN, D.D., LL.D.: Scottish Congl. theologian; b. near Edinburgh, 1838, Nov. 4. Having studied at the Univ. of Edinburgh, he accepted a pastorate at Bathgate, Linlithgow, Scotland, and afterward went to Germany, where he continued his studies at Berlin. On his return to Scotland he preached at Aberdeen, and at the same time became a noted contributor to the press of essays on theological subjects. He was chosen principal of the Congl. college at Airedale 1878, and in the same year the Univ. of Edinburgh conferred on him the degree D.D. He was Muir lecturer on comparative religions, 1881-83. In 1883, he was chairman of the Congl. Union of England and Wales, and since 1888 he has been principal of Mansfield Coll., Oxford. He visited America in 1890, and in 1892 delivered the lectures at Yale Divinity School on the Lyman Beecher foundation. Among his published works are *Studies in the Philosophy of Religion* (1876); *Studies in the Life of Christ* (1880); *The City of God* (1882); *Christianity in the First and Nineteenth Centuries* (1883); *Religion in the History and*

Life of To-day (1884); *The Place of Christ in Modern Theology* (1893) and *Philosophy of the Christian Religion* (1902).

FAIRBAIRN, Sir WILLIAM, LL.D., Bart.: 1789-1874, Aug.; b. Kelso, in Roxburghshire, Scotland. After a little schooling he was apprenticed to an engine-wright at Percymain Colliery, North Shields; then wrought for two years in London; and then visited many places in England, Wales, and Ireland, working a short time at each, observing the various practices of different localities. Eventually, he commenced business on his own account in Manchester, 1817, without money or helpful connections. The first great improvement introduced by Fairbairn was the substitution of iron for wood in the shafting of cotton-mills, and the substitution of light for heavy shafting of metal. This economized cost, and enabled the motion to be speeded from 40 to 160 revolutions per minute. Fairbairn was among the earliest iron ship-builders, and originated various improvements in their construction, and his firm built several hundred vessels.

In 1834-5, Fairbairn was engaged in seeking the cause of defects in the iron produced by hot-blast furnaces, and in testing the strength of various kinds of iron, the tenacity of boiler-plates of various thicknesses, and the best mode of riveting.

The first idea of a tubular bridge across the Menai Strait is due to Robert Stephenson, but its realization is due to Fairbairn. Stephenson's idea was a circular tube, supported by chains, but the Britannia and Conway bridges are rectangular structures, strengthened by a series of cells at the top and bottom, and without chains or any other support from pier to pier. The present form results from a long series of experiments upon model tubes—circular, egg-shaped, and rectangular. Fairbairn erected more than a thousand bridges on this principle: see TUBULAR BRIDGE. Fairbairn was created a baronet 1869. He published numerous works and papers on iron bridges, boilers, mills, etc. He was member of many scientific societies. See his life by W. Pole (London 1877); and Smiles's *Lives of the Engineers*.

FAIRBANKS, CHARLES WARREN: American lawyer and statesman: b. near Unionville Centre, Union county, Ohio, 1852, May 11. After obtaining his early education in the district schools he attended the Ohio Wesleyan University, whence he was graduated in 1872. While in college he edited the college journal, the 'Western Collegian.' He then went to Cleveland where he became an Associated Press agent, in the meantime studying law. In 1874 he was admitted to the bar of the Supreme Court of Ohio at Columbus, and removed to Indianapolis, Ind., in the same year, where he soon acquired a large practice and where he has since lived. In 1892 and again in 1898 he was chairman of the Indiana State Convention; in 1893 was defeated as the Republican nominee for U. S. Senator, by David Turpie, the Democratic candidate. In 1896 he was a delegate to and temporary

chairman of the Republican National Convention at Saint Louis; in 1897 was elected Senator and was re-elected at the expiration of his term. In 1898 he was appointed a member of the United States and British Joint High Commission which met in Quebec for adjusting Canadian questions and disputes. In 1904, Nov., he was elected Vice-President of the United States.

FAIRBANKS, *fär'bănks*, ERASTUS, LL.D.: 1792, Oct. 28 —1864, Nov. 20; b. Brimfield, Mass.: manufacturer. He was educated for the law, but abandoned it on account of weak eyes, and removing to St. Johnsbury, Vt., formed a partnership with his brother Thaddeus, and began manufacturing cast-iron plows 1824. In 1831 the brothers began making the celebrated scales, invented by Thaddeus Fairbanks. Their works became greatly extended and they amassed wealth. Erastus was a member of the Vermont legislature 1836-38, and governor 1852-55, 1860-61. He was a liberal promoter of religious and charitable enterprises.

FAIRCHILD, *fär'chīld*, CHARLES STEBBINS: lawyer: b. Cazenovia, N. Y., 1842, Apr. 30. He graduated at Harvard 1863, and its law school 1865; was admitted to the bar the latter year; joined the law firm of Hand, Hall, Swartz, and Fairchild; was appointed dep. atty.-gen. of N. Y. 1874; elected atty.-gen. as a democrat 1876; settled in New York to practice 1880; was appointed assistant secretary of the treasury department 1885; and was appointed secretary of the treasury by President Cleveland to succeed Daniel Manning 1887, Mar. 31. He is president New York Security and Trust Co.; treasurer State Charities Aid Association; vice-president Charity Organization Society, N. Y., and trustee New York Life Ins. Co.

FAIRCHILD, GEORGE THOMPSON, American educator: b. Brownhelm, Ohio, 1838, Oct. 6; d. 1901. He was graduated from Oberlin College 1862, and from Oberlin Theological School 1865; was professor of English literature Michigan Agricultural College 1879-97; and vice-president of Berea College from 1898. He entered the Congregational ministry in 1871 and published *Rural Wealth and Welfare: Economic Principles Illustrated and Applied in Farm Life* (1900).

FAIRCHILD, HERMAN LE ROY, American educator: b. Montrose, Pa., 1850, April 29. He was graduated at Cornell University in 1874; was secretary of the New York Academy of Science in 1885-88; became president of the Rochester Academy of Science in 1889, secretary of the Geological Society of America in 1890, and vice-president in 1898. He has been professor of geology at the University of Rochester from 1888, and has published a *History of the New York Academy of Sciences* (1887).

FAIRCHILD, JAMES HARRIS, D.D.: ex-pres. of Oberlin College: b. Stockbridge, Mass., 1817, Nov. 25; d. 1902. He was removed by his parents to Brownhelm, O., when an infant: graduated at Oberlin College 1838, was tutor there

1838-42, ordained as a Congl. minister 1841, prof. of languages 1842-47, prof. of mathematics 1847-58, prof. of moral philosophy and theol. 1858-66, and elected pres. of the college 1866. He resigned the presidency 1889. Fairchild received his degree from Hillsdale College 1864. His publications include *Moral Philosophy* (1869, revised ed. 1892); *Oberlin, the College and the Colony,* 1833-83 (1883); editions of *Memoirs of Rev. C. G. Finney* (1876), and *Finney's Systematic Theology* (1878); *Elements of Theology* (1892).

FAIRCHILD, Lucius, lawyer: b. Kent, O., 1831, Dec. 27; d. Madison, Wis., 1896, May 23. He received a public school and collegiate education; removed to Madison, Wis., 1846; made an overland ox-team journey to the California gold mines 1849; returned to Madison, was elected clerk of the circuit court and began studying law 1858; and was admitted to the bar 1860. In 1861 he served as captain 1st Wisconsin vols., in the 3 months' campaign, and at its close was appointed captain 16th U. S. infantry and major 2d Wisconsin infantry; in June he was promoted lieut.-colonel; and July commanded the 2d and 7th Wisconsin regiments in the 'iron brigade' in the first Bull Run (q.v.) battle. He served through the McClellan and Pope campaigns; took part in 14 battles and important engagements; lost his left arm while leading a charge at Seminary Hill, Gettysburg, and was promoted brigadier-general 1863, Oct. 19. In the following month he was elected secretary of state of Wisconsin, and resigned his army commission to assume his new office 1864, Jan. 1. In 1865 he was elected governor and served six consecutive terms. In 1872 he was appointed United States consul at Liverpool; 1878 was transferred to Paris as consul-general; 1880 was appointed U. S. minister to Spain; 1881 resigned; 1882-3 was pres. of the International Exposition of Railway Appliances at Chicago; and 1886 was elected commander-in-chief of the Grand Army of the Republic.

FAIRFAX, *fär'făks,* Edward: translator of Tasso's *Jerusalem Delivered:* natural son of Sir Thomas Fairfax of Denton, in Yorkshire; year of birth unknown; supposed to have died soon after 1631. He spent his life at Fuystone, in the forest of Knaresborough, in competence and ease, amid rural scenes, and with ample command of the means of study. His celebrated translation of Tasso was made in the reign of Queen Elizabeth, to whom it is dedicated. The first edition bears date 1600. For poetical beauty and freedom, it has had universal praise. Dryden ranked Fairfax with Spenser as a master of English, and Waller said that he derived from him the harmony of his numbers. Fairfax wrote also a treatise (pub. 1858-59) on *Demonology,* in which he was a believer—a credulity probably helpful in the translation of a work full of the machinery of enchantment.

FAIRFAX, Thomas Lord: general of the parliamentary

troops in England during the civil wars under Charles I.: 1612, Jan. 17—1671, Nov. 12; b. Denton, Yorkshire; son of Ferdinando, Lord Fairfax. He studied at St. John's College, Cambridge, and afterward served as volunteer in Holland under Lord Vere, whose fourth daughter, Anne, he married soon after his return to England. On the outbreak of the civil war, 1642, Fairfax warmly espoused the cause of the parliament, and was appointed cavalry-gen. under his father who commanded the parliamentary forces in the north. He distinguished himself by valor, prudence, and energy, and when the Earl of Essex resigned his office of gen. of the parliamentary forces, 1645, Fairfax was appointed in his place. In a short time, Cromwell, who had been appointed lieut.-gen., obtained unbounded influence over him; and from this time, though nominally head of the parliamentary forces, he really acted a secondary part. At last, 1650, June, he refused to march against the Scots, who had proclaimed Charles II. king, and Cromwell was appointed commander-in-chief in his stead. Fairfax now withdrew into private life, and did not come forward again until after the death of Cromwell, when he showed a zeal for the restoration of the king, gathered troops for that purpose to assist General Monk against Lambert; and was appointed one of the delegates dispatched to the Hague 1660 to promote the return of Charles II. He died at Nunappleton. Fairfax had some taste for literary pursuits, and wrote several works, prose and poetic. See his Correspondence (4 vols. 1848-9), and Life by C. R. Markham (1870).

FAIRFAX, Thomas, Lord: 1691-1781, Dec. 12; b. England: grandson of Lord Culpepper, colonial gov. of Va.; founder in Va. of the family of F. He was educated at Oxford Univ.; wrote some time for the London *Spectator;* removed to Va., to look after the estate of 5,282,000 acres between the Potomac and Rappahannock rivers inherited from his mother, 1739; and after visiting England established himself permanently at Greenway Court, 12 m. from Winchester, 1745. Anne, daughter of his cousin, Sir William, married Lawrence, brother of George Washington, and F. becoming thus acquainted with the future gen., employed him to survey his great domain, 1748. During the revolutionary war he was a firm loyalist, yet such were his noble qualities that his property was respected both by the Americans and by the British during the struggle. He survived the mortification of Cornwallis's surrender at Yorktown only a few weeks, and after the war his property was confiscated.

FAIRFIELD, Conn., town, port of entry, in Fairfield county; three miles southwest of Bridgeport; on the Long Island Sound, the New York, N. H. & H. railroad. The chief manufactures are paper, rubber goods, and machinery. It has good public buildings, two libraries, and four buildings which date from Revolutionary times. The first settlement was made in 1869 and the town was incor-

porated the same year. It was the scene of several Indian and Revolutionary battles, and in 1779 was almost wholly burned by the Hessians and Tories. Pop. (1900) 4,489; (1910) 6,134. Consult: Osgood, *Centennial Commemoration of the Burning of Fairfield.*

FAIRFIELD, Ill., city, county-seat of Wayne county; 123 miles southeast of Springfield; on the Louisville, E. & St. L. and the B. & O. Southwestern railroads. The manufactures are chiefly flour, lumber, and dairy products. The trade is in agricultural products. It is the site of the Hayward Collegiate Institute. Pop. 2,500.

FAIRFIELD, Iowa, city, county-seat of Jefferson county; 48 miles northwest of Burlington; on the Chicago, R. I. & P. and the C. B. & Q. railroads. The principal manufactures are brooms, tile, agricultural implements, machinery, furniture, carriages, flour, and dairy products. The electric-light plant and the water-works are owned by the city. The Parsons College, under the auspices of the Presbyterian church, was founded here in 1875. The first settlement was made in 1839. Pop. (1910) 4,970.

FAIR HAVEN (Conn.): see NEW HAVEN.

FAIRHAVEN, WASH., city in Whatcom county; on an arm of Puget Sound; 42 miles northeast of Victoria, in Canada, and 88 miles north of Seattle; on the Northern P. and the G. N. railroads. It is near a good agricultural region; its principal manufactures are canned salmon, tin cans, flour, and lumber. Fairhaven was first settled in 1888. Its natural advantages combined with its opportunities for railroad transportation make its outlook most promising. Pop. (1910) 4,300.

FAIR HA'VENS: harbor on the s. of Crete, near the port of Lasæa, ruins of which were discovered by an English yachting party 1856. The evangelist Luke is the only ancient writer who mentions it (Acts xxvii. 8). When the apostle Paul and other prisoners were being taken by ship to Italy, they sailed close to the Fair Ha'vens, where Paul urged the master of the ship to take refuge as he perceived that the voyage would be disastrous. The master preferred the haven of Phenice, which was more commodious to winter in, and on the way thither the Euroclydon tempest arose and wrecked the ship on the island of Melita.

FAIR ISLE: solitary isle in the Atlantic, 25 m. s.s.w. of Shetland, 4 by 2½ m. in extent, rising 708 ft. above the sea, with high rocky cliffs and promontories It affords copper ores, and hand-shaped sponges called 'trowie gloves.' The people are chiefly fishers. At Stromceiler Creek, was wrecked, 1588, the Duke of Medina Sidonia, admiral of the Spanish Armada. He escaped, after most of his crew were murdered. From the Spaniards who remained, the natives acquired a knowledge of the art of making woolen articles, such as caps, mittens, and stockings, in divers colors, which are still a staple for export.—Pop. (1901) 147.

FAIRMONT, W. Va., city, county-seat of Marion coun-

ty; on the Monongahela river and the Baltimore & Ohio railroad; 75 miles southeast of Wheeling. It is the site of a State Normal school; its principal manufactures are glass, machinery, cigars, lumber, and iron products. It has considerable trade in coal, coke, and manufactured articles. Pop. (1910) 9,711.

FAIRMOUNT COLLEGE, a coeducational preparatory school and college, under the auspices of the Congregationalist church. It was established in 1892, with assistance from the Boston Education Society. A collegiate department was added in 1895. In 1907 there were 21 professors and instructors, 304 pupils, and 26,000 volumes in the library.

FAIR OAKS, or SEVEN PINES, BATTLE OF: 1862, May 31 and June 1. After the Confederate evacuation of Yorktown, May 3-4, and the battle of Williamsburg, May 5, Gen. McClellan advanced cautiously on Richmond, and May 20-25, the 3d and 4th Corps, commanded respectively by Gens. Heintzelman and Keyes, were thrown to the south bank of the Chickahominy River where they constructed defensive works, the advance line at Seven Pines, Henrico County, Va., about five miles from Richmond. The corps of Sumner, Fitz John Porter and Franklin remained on the north bank of the river. On the 25th Gen. Casey's division of the 4th corps advanced about three-fourths of a mile to Fair Oaks Station, and threw up works. Gen. Couch's division remained at Seven Pines. Gen. Johnston, commanding the Confederate forces, seizing this favorable opportunity to crush two corps of the Union army, while the other three were on the north bank of the river, marched out from Richmond, and at 1 P.M. of May 31, fell upon Casey's division at Fair Oaks, and after a hard fight of two hours drove it back upon Couch's division at Seven Pines. Both parties were now re-enforced and the Union troops were driven back from Seven Pines to a line of works one mile in rear, which was held. About 5 P. M. Gen. Sumner, who had crossed the Chickahominy, came upon the field with Gen. Sedgwick's division of the 2d corps just in time to meet and check the advance of the Confederate left, which was closing in on the Union right flank. The fighting was very severe, and at 7 P. M. Gen. Johnston was severely wounded, and Gen. G. W. Smith succeeded to the command. This Union success closed the day's fighting. The fighting was renewed on the morning of June 1, with the result that the Union troops regained most of the ground taken from them the preceding day, and June 2, Gen. Lee, who had assumed command of the Confederate forces, fell back to Richmond. The Union forces actually engaged numbered about 36,000; the loss was 4,384 killed, and wounded, and 647 missing. The Confederate forces engaged were about 32,000 men; their loss 5,729 killed and wounded, and 405 missing.

FAIRS [see FAIR]: great periodical markets, some of

which are devoted chiefly to one kind of merchandise, while others, of wider scope, afford opportunity for most of the sales and purchases of a district. Fairs have long been regularly held in most parts of Europe, and in many parts of Asia; but as they belong to a state of things which is passing away, they have not been established or have not acquired importance in America. In Europe, they appear to have originated in the church festivals, which afforded convenient opportunities for commercial transactions, the concourse of people being such as took place upon no other occasion. This origin of fairs is commemorated in their German name *Messen*, which is derived from the word employed to denote the most solemn part of the church service: see MASS. Some festivals, from circumstances of place and season, speedily acquired greater commercial importance than others, and drew buyers and sellers from remote countries. When the ordinary means of communication and of exchange of commodities were very limited, fairs were of great use. Princes and the magistrates of free cities found it to their advantage to encourage them, and granted them many privileges. Courts of summary jurisdiction—commonly called *pié poudre*, from the dusty feet of the suitors—were established distinct from the ordinary courts of the county or city, for the determination of questions which might arise during the fair. In connection with all this, the practice was necessarily adopted of publicly proclaiming the commencement and duration of the fair, and this still subsists, as in the annual fairs of some great cities of Britain, where scarcely any other vestige remains of the old privileges of fairs, and where they might, with advantage to all the interests of society, be now abolished.

In western Europe, the goods exposed for sale at fairs are chiefly those in respect of which there is frequent change of fashion. Provisions are seldom an article of merchandise in them, though in some parts of the continent persons of all ranks still wait for the great yearly fairs to make their principal purchases of manufactured articles. It is otherwise, however, in places on the outskirts of civilization; and almost all the produce of great provinces is sold, and all that their inhabitants require is bought at such fairs as those of Kiachta and Nishnij-Novgorod. The British fairs really of much use at the present day are chiefly for the sale of cattle; of these some held on the borders of the Scottish Highlands, and elsewhere in Scotland, are frequented by buyers and sellers from all parts of the kingdom, and bring together the breeders of cattle and the graziers, by whom the animals are to be fed for the butcher. Such are the fairs or trysts, as they are called, at Falkirk, Doune, Edinburgh, etc. At other great yearly fairs in the south of Scotland, lambs and wool are sold; and fairs chiefly for the sale of the annual produce of pastoral districts are common in many parts of the world.

The greatest fairs in the world are the Easter and

Michaelmas fairs at Leipsic. These are not to be confounded with the Leipsic Book-fair, which is chiefly an occasion for the settlement of accounts among booksellers and publishers. Next to the Leipsic fairs, those of Frankfurt-on-the-Main are the most important in Germany. The fairs of Frankfurt-on-the-Oder, and of Brunswick in Germany, of Zurzach in Switzerland, Pesth in Hungary, Sinigaglia and Bergamo in Italy, Beaucaire and Lyon in France, and Nijni-Novgorod (q.v.) in Russia, are among the most important in Europe. After the great fairs of Leipsic, that called the Fair of St.Peter and St. Paul at Nijni-Novgorod is the greatest in the world, and is frequented by buyers and sellers from different parts of Europe, and of n. and central Asia. The fairs of Tanta in Upper Egypt, of Kiachta in the s. of Siberia, of Irbit, also in Siberia; of Mecca in Arabia, and of Hurdwar in w. India, also are of very great importance, and are the most considerable out of Europe. That of Kiachta is a sort of barter-market, where almost all the commercial transactions between the Russian and Chinese empire take place. The fairs in Britain have latterly in some cases degenerated into scenes of merriment, such was Bartholomew Fair, London, now extinct; also Greenwich Fair, Glasgow Fair, and Donnybrook Fair, near Dublin—this last likewise either extinct, or nearly so. The boisterous merriments at these fairs were of old the devices employed as likely to attract a great concourse of people; hence each fair had its sport or drollery—football, wrestling, yawning, cudgel-playing, throwing at cocks, sack-races, flying dragons, grinning through horse-collars, mock-giants, monstrous fishes, soaped pigs, smoking-matches, eating hot hasty-pudding, whistling, wheelbarrow races. M. Bottin, author of a statistical *View of the Fairs of France*, says that on examining his work it will appear that they were placed for the most part on the frontiers of the kingdom, or on the marches of ancient provinces; or at the foot of high mountains, at the beginning or end of the snow-season, which for months shuts up the inhabitants in their valleys; or in the neighborhood of famous cathedrals or churches frequented by flocks of pilgrims; or in the middle of rich pastures. An old fair in the n. of Scotland, in June, when the nights are very short, began at sunset, and ended an hour after sunrise: it was called 'Sleepy Market.'

FAIR TRADE: term introduced into the later discussion in England on the free-trade policy, to denote a mild modification of the protective system, based on international reciprocity. Fair traders hold that if they can import goods cheaper from a protectionist country than elsewhere, they should be free to reap that advantage even if they cannot export their own goods to that country free of duty. In Britain, fair trade is sometimes also associated with projects of imperial federation; and then it included differential treatment by the mother country in favor of the British colonies as against foreign nations. See FREE TRADE; TARIFF; PROTECTION.

FAIRY, n. *fā'rĭ* [OF. *faerie*, enchantment: It. *fatare*, to charm as witches do: Sp. *hadar*, to divine: F. *féerie*, witchery—from *fée*; OF. *fae*, an elf, at fairy (see FEY)]: an imaginary good or bad being, said to influence the fate of men: ADJ. of or pert. to fairies. FAIRY-LIKE, like a fairy. FAIRY-LAND, the supposed abode of the fairies. FAIRY-RINGS: see below. FAIRY-BEADS, n. *bēdz*, in *geol.*, the small perforated and radiated joints of the fossil *Crinoidea*, found abundantly in the shales and limestones of the carboniferous or mountain limestone formation; also called St. Cuthbert's Beads. FAIRY-GREEN: see FAIRY-RINGS. FAIRY-LINT, n. in *bot.*, *Linum catharticum*. FAIRY-MONEY, n. treasure-trove; money given by the fairies was said to change after a time into withered leaves or rubbish; hence, something that becomes valueless. FAIRY-PURSES, n. in *bot.*, a kind of fungus. It is like a cup, or old-fashioned purse, with small objects inside; probably *Nidularia campanulata*. FAIRY-SHRIMP, n. in *zool.*, a species of phyllopodous crustacean, *Chirocephalus diaphanus*, occasionally found in fresh-water ponds. It is about one inch in length, and nearly transparent. FAIRY-THIMBLES, or FAIRY-WEED, n. in *bot.*, *Digitalus purpurea*. FAIRY-STONES, the flinty fossil sea-urchins found in the chalk of the south of England; concretionary nodules of clay found in streams and river-courses.—*Fairies*, or Elves were supposed supernatural beings, generally of human form but diminutive size. A belief in them has been among the superstitions of a greater portion of the European nations. The word *elf* is from Anglo-Saxon *ælf*, which corresponds to Danish *alf*, Icelandic *álfr*, and German *alp;* but the Germans adopted, in the 18th c. *elf* and *elfe*, from the English for the same idea. Fairy is properly enchantment, or the realm of fairy spirits, *fay* being originally the name of the sprites themselves. Fay (Low Latin *fata*, fairy; French *fée*) is from Latin *fatum*, fate, and anciently meant the goddess of destiny. From the Old French *fae* (=*fée*) comes *faerie*, enchantment; whence fairy. The Celtic fees or fairies are undoubtedly relics of those *matres* and *matronæ*, which appear on Gallo-Roman inscriptions as objects of popular belief. After the transfusion of the Teutonic and southern nations, the northern elves (originally of two kinds—the light elves, or elves proper, and the dark elves, or dwarfs) became mingled with their Celtic kindred the fairies in inextricable confusion.

It is generally difficult to give any scientific definition of the nature of a superstition, because its phenomena are continually varying with the time, place, and other conditions. The fairy superstition especially defies definition, because it was the peculiarity of the creatures to whom it referred that they followed no regular law, human or divine, but obeyed the impulse of their own caprice; hence every fairy tale differs from another. Still, there are distinctions and specialities that emerge in the examination of a large number of these narratives. In the first place, the superstition belongs peculiarly to modern Europe. We find nothing like it among the idolatries of the heathen referred to in Scripture, nor does the word occur in the

English Bible, or its equivalent in the original texts. In classical mythology, there is nothing nearer to it than the nymph of the fountain or grove among the Greeks. In the next place, it may be determined that the varieties in the superstition correspond, in some measure, with those of the physical geography of the districts in which it prevails. In those parts of the world where there are mountains, mists, dangerous morasses, cataracts, and stormy oceans, all superstitious beliefs relating to supernatural agencies, are naturally exaggerated, and, from the appalling dangers to which they relate, the belief takes deep root in the common mind. Accordingly, in flat and well cultivated countries like England, the fairy superstition is simple and homely, connecting itself with matters of domestic routine, such as the sweeping of the dwelling-house, the skimming of the milk, the preservation of the butter, and the like; while in the Scotch Highlands and Scandinavia the fairy folk are connected with storms and convulsions, betray people to their death, fly away with them into the infinite cloud-land, or lead them through endless caverns within the earth. It has been observed, as a further distinction, that the fairies of the German or Teutonic tribes are more harsh, fierce, uncomely, or deformed than those of the Celtic nations, which have a tendency rather to the aërial and the graceful. Still, there is so great an amount of common characteristic in the superstition throughout Europe, and its peculiarities have been found so much more emphatically displayed in Scandinavia than elsewhere, as to have suggested to some the view, that the superstition is a remnant of the old mythology of the northern nations, communicated by them to a greater or less extent to all the countries over which their vikings carried their ravages.

There is a further distinction—at least in Britain—between the fairies of poetic and heroic literature and those of popular belief—the former being princes and princesses of chivalry, distinguished from human beings only by their superhuman superiority in all the qualities which elicited respect in the age of chivalry: while those of popular belief are small in stature, sometimes decrepit and endowed with dispositions generally allied more to malignity than to magnanimity. It is common to all classes of them to be deemed under the condemnation of the religion of the gospel, and to be either conditionally or unconditionally excluded from the abodes of the righteous in the next world. In Ireland and the Highlands, they have been spoken of as a wandering remnant of the fallen angels. It is sometimes a symptom of geniality and kindliness in a people when their fairies are supposed to be capable of earning their own redemption. Sometimes they are supposed to be human beings, metamorphosed or disembodied, and this form of the superstition has made fairyland a place of purgation for those whose sins have condemned them to it. The analogy is carried out in the belief that the services of the living can extricate the souls so situated; but it is rather through dexterity and courage than pure

piety that the feat is achieved, and the rescues from fairy-land form some of the most wild and exciting of the elfin narratives—as, for instance, the strange, wild ballad of *Tamlane*.

There is still another broad distinction of fairies into those that dwell in the upper air and those that dwell within the bowels of the earth, while a third class frequent the waters. The surface of the earth on which mankind reside is not deemed the proper place of any class of elves except on special occasions. The Scandinavians called the fairy inhabitants of the air white elves; those of the earth, black. Whatever was genial, light, playful, and benevolent in the superstition, clustered round the former; the latter did all the work that was dark, cruel, and rapacious. Naturally enough, the black or subterranean kind frequented mining districts, where they might be seen extracting the ore for themselves, and thus unwittingly leading the miner to rich veins of metal. They might be seen in an occasional peep through an aperture of a hill in their underground retreats, in chambers supported on jasper columns, where they were stowing away their hampers of gold and silver—for they were generally held to be very affluent. Some of the most exciting tales about the German gnome, and the Irish leprechaun, a creature of the same kind, are founded on the efforts of adventurous mortals to get possession of their riches. There exists a legend, in nearly identical terms in several countries, which connects some piece of valuable plate belonging to a church with the underground fairies. The story of the horn of Oldenburg is a type of these narratives. The pictures of it represent it as a beautiful drinking vessel, in the shape of a horn, exquisitely decorated with finest fanciful silver-work, in the style contemporary with the richest Gothic architecture. The legend is, that Otho of Oldenburg, exhausted with hunting, and very thirsty, exclaimed: 'O God, would that I had a cool drink!' Thereupon there appeared before him, as if coming out of the rock, a lovely maiden, who offered him a drink in the fairy horn. He made off with it, and saved himself from evil consequences by bestowing it on the church. Hence these relics are generally in churches; but one of them is, or lately was, in the possession of an English family, and as their prosperity was traditionally believed to depend on retaining it, it was called 'The Luck of Eden Hall.'

Puck and the pixies belong to the same class of beings. Of the ell-folks of Scandinavia, the male is old and ill-favored, but the evil element in the ell-woman or ell-maid consists in her beauty, which enables her to be very dangerous to foolish young gentlemen, whom she waylays either by her own proper charms, or by personating the objects of their affections.

In Ireland, and in the border country of Scotland, the fairy superstition has been the theme of innumerable poetic legends and mystic traditions. T. Crofton Croker, in the *Fairy Legends and Traditions of the South of Ireland*, 3 vols. 1828, presents a full and amusing account of the Irish

fairies, or elves, which he describes as 'a few inches high, airy, and almost transparent in body; so delicate in their form that a dew-drop, when they chance to dance on it, trembles indeed, but never breaks. Both sexes are of extraordinary beauty, and mortal beings cannot be compared with them.' They do not live alone, or in pairs, but always in large societies, and are governed by a queen. The same author adds: 'They are invisible to man, particularly in the day time, and as they can be present and hear what is said, the peasantry never speak of them but with caution and respect, terming them the good people, or friends. They have their dwellings in clefts of rocks, caves, and ancient tumuli. Every part within is decorated in the most splendid and magnificent manner; and the pleasing music which sometimes issues from thence in the night has delighted those who have been so fortunate as to hear it.' There are Irish fairies, however, of more special character. Among these are the Banshee, or female spirit who watches a particular family; the Cluricaune, an elf of evil disposition, who usually appears as a wrinkled old man, and has a knowledge of hidden treasure; and the Phooka, a spirit of diabolical disposition who sometimes appearing as an eagle or a black horse, hurries to destruction persons of whom he gets control. Of similar varieties are the Scottish elves: the Brownie, or domestic spirit nearly corresponding to the Banshee; the Kelpy, a kind of water-horse, being little different from the Phooka; and the Cluricaune being as regards figure somewhat analogous to the being sung by Leyden in his charming ballad, 'The Cout of Keilder' (*Minstrelsy of the Scottish Border*):

> 'Brown dwarf, that o'er the Muirland strays,
> Thy name to Keeldar tell!'
> 'The Brown Man of the muirs, who stays
> Beneath the heather-bell.'

According to Irish as well as Scottish fairy superstition, the elves, though in the main harmless, or at most tricky, have the bad reputation of stealing away young children from the cradle and substituting for them a changeling who bears a resemblance to the stolen infant, but is an ugly little creature, and never thrives. On this theft of a female infant, who is carried to Fairyland, but in the course of years returns to her parents, James Hogg founded his fine ballad of 'Kilmeny' (*Queen's Wake*). It need hardly be added, that in the progress of general intelligence, the fairy superstition has disappeared in Scotland as well as in the greater part of Ireland, and now is as little a matter of credence as is the belief in England of that useful drudging fiend, Robin Goodfellow. Besides being embalmed in imaginative literature, the fairy has a perpetual memorial in the small exquisitely shaped arrow-heads found so abundantly in northern countries, where they were long known as elf-arrows, or bolts with which the more malignant fairies sometimes slew or injured cattle and human beings; thus, when a poor man's cow or heifer was suddenly affected with some deadly and incomprehensible illness, it was said to be 'elf-shot:' see ELF-ARROWHEADS.

For the most comprehensive account in the English language of the various shapes assumed by this superstition, see *The Fairy Mythology*, by Thomas Keightley.

FAIRY RINGS : spots or circles sometimes seen in pastures, which are either more bare than the rest of the field, or more green and luxuriant. Frequently a bare ring appears, like a footpath, with green grass in the centre, and the circle which the ring forms, or of which it might form a part, is often some yards in diameter. These rings began to attract the attention of men of science in the latter part of the last century, and various hypotheses were suggested to account for them. Some imagined that they might be the effect of lightning. Dr. Withering appears to have been the first to ascribe them to the growth of fungi. Dr. Wollaston further investigated the subject, which has more recently been very fully investigated by Prof. Way; and it is now ascertained and universally admitted that fairy rings result from the centrifugal development of certain kinds of fungi, especially of *Agaricus oreades, A. gambosus, A. coccineus* and *A. personatus*. The Common Mushroom (*A. campestris*) shows a tendency to grow in the same manner. Probably the spot where the agaric has already grown is unfitted for its continued nourishment, and the *mycelium* (spawn) extends outward to new soil, the fungus unfitting the soil to which it extends for the immediate nourishment of grass, but enriching it afterwards by its own decay. The *mycelium* of many fungi has certainly a tendency to extend outward from a centre; and decayed fungi, containing not a little of the phosphate of potash, are a highly stimulant manure for grasses. Fairy rings of large size sometimes occupy the same situation for many years. The circle is almost always imperfect, some accidental circumstance having arrested the growth of the mycelium on one side.

FAIT ACCOMPLI, n. *fāt ak-kŏng-plē* [F.]: a fact already accomplished or completed; a scheme or idea already carried out.

FAITH, n. *fāth* [OF. *feid;* F. *foi*—from L. *fidem*, trust: It. *fede*, faith: comp. Gael. *feath*, calmness]: belief; trust; confidence; sincerity; belief in revealed religion; trust in God; a system of doctrines or tenets. FAITHED, a. *fātht*, in *OE.*, invested with credibility; believed. FAITH′FUL, a. constant; of true fidelity; not fickle; true; exact. FAITH′FULLY, ad. *-lĭ*. FAITH′FULNESS, n. constancy; fidelity. FAITH′LESS, a. *-lĕs*, not true in the performance of duty; false; not believing. FAITH′LESSLY, ad. *-lĭ*. FAITH′LESSNESS, n. perfidy; unbelief; treachery. FAITH BREACH, in *OE.*, breach of fidelity; perfidy. THE FAITH, the Christian religion. THE FAITHFUL, those firm in their adherence to the truths of Christianity; applied to their co-religionists by Rom. Catholics and by Mohammedans. DEFENDER OF THE FAITH: see under DEFEND.—SYN. of 'faithful': trusty; honest; upright; sincere; veracious; loyal.

FAITH : term used in various senses in theology. It is taken sometimes to denote the mere assent of the under-

standing to a set of facts or of propositions set before it; it is more properly, or more scripturally, used to express the living reception by the heart of the 'truth as it is in Christ.' Some divines have enumerated no fewer than four kinds of faith: 1. The faith of miracles, or that immediate persuasion of the Almighty presence and power of their Master, which enabled the early Christians to work miracles—a persuasion, apparently, which might exist and issue in astonishing results without being associated with moral excellence: 'Though I have all faith,' says the Apostle Paul, 'so that I could remove mountains, and have not charity, I am nothing.' 2. Historical faith, or the assent of the mere intellect to truth, the evidence of which is irresistible, such as we have described above. 3. Partial or temporary faith, such as our Lord implies in his exposition of the parable of the Sower, and as appeared to animate those who, after having followed after Christ, turned back and walked no more with him. 4. Saving faith, or the persuasion of Christian truth wrought in the heart of the Holy Spirit—the chief Scriptural sense of the term.

These distinctions are theological refinements; the proper and characteristic meaning of the term in Scripture has little to do with any of them except the last. 'Faith,' says the writer of the Epistle to the Hebrews, 'is assurance of things hoped for, a conviction of things not seen.' It is a vision, a quality, or capacity of soul for action,—manifesting itself in the soul as a 'grace' or free gift of God—whereby spiritual truth is apprehended, and spiritual life engendered. The distant is brought near by it, and substantially appropriated; the unseen is felt to be a reality. Faith is the movement by which the soul passes beyond the present and the visible to the eternal and the invisible. Still more characteristically, perhaps, faith is the living affection which binds the Christian to Christ *as a personal Savior*. 'What shall I do to be saved?' asked the Philippian jailor of Paul. 'Believe on the Lord Jesus Christ,' was the reply, 'and thou shalt be saved.' It is Christ or God—a living person—rather than any mere truth or system of truths which is represented as the proper object of Christian faith. 'Believe in God, believe also in me.' 'We believe on him that raised Jesus our Lord from the dead.' 'Abraham believed God, and it was reckoned unto him for righteousness.' 'Come unto *me* all ye that labor and are heavy laden, and I will give you rest.'

Faith, therefore, in this its highest view, is nothing but supreme trust in God and His Christ. This is the faith which 'worketh by love,' and 'overcometh the world'—the faith of which the Apostles Paul and John alike speak. The faith mentioned by the Apostle James in apparent conflict with works is different; it seems to have been a mere religious distinction as between parties of Christians—'Thou hast faith, and I have works.' One party put forth faith as their religious badge—another works. The spiritual or true meaning of either the faith or the works was little regarded. The Scriptures teach always that a faith

that does not issue into works and control the life, is not really faith.

Faith, in the distinctively Christian sense, can exist only by the operation of God's Holy Spirit. 'For by grace have ye been saved, through faith; and that not of yourselves; it is the gift of God.' Evangelical divines greatly insist on the necessity of this operation of the Spirit of God, yet in no wise thereby excluding the active co-operation of man, but rather as indicating the deepest ground of the man's action in believing. The Pelagian and Antinomian extremes respectively throw out—the former the divine; the latter the human element. The Scriptural teaching combines the two. For some principal theological controversies connected with faith, and not above mentioned, see JUSTIFICATION.—For the Analogy of Faith, see ANALOGY.

FAITH CURE: the theory (or practice based on the theory) that any form of disease may be banished by a divine personality in response to faith. The term is frequently used in a broad sense as synonymous with 'mind cure,' or 'psychotherapy' but it is well to retain the narrower use of the term and to apply it only to those cases in which divine intervention is alleged. In this narrower sense it is synonymous with Divine healing or faith healing.

Faith cures or approximations to them are reported among diverse peoples of the earth and from the earliest times to the present day. In the main, however, faith cure is a theory of the Christian world and is based on the practice and teaching of Jesus. Numerous instances are reported in the New Testament in which Jesus cured the sick. Many passages from the teaching of Jesus make it clear that he intended to have his practice continued by his followers. That these directions were not intended for the chosen few is evidenced by statements written by the Apostle James near the end of the apostolic period. ('Is any among you sick? let him call for the elders of the church; and let them pray over him, anointing him with oil in the name of the Lord: and the prayer of faith shall save him that is sick, and the Lord shall raise him up.') It is certain that the practice was continued by the Apostles and Church Fathers and that the theory and practice became so thoroughly established that for centuries other means for the restoration of health were looked upon with disfavor or even excluded as dishonoring God. It is only since the recent advance in natural science and medicine that the 'regular' medical practitioner has been licensed and protected by the State in Christian communities.

Among the more prominent advocates and practitioners of faith cure of recent years should be mentioned Pastor Blumhardt of Boll, Dorothea Truedel and Professor Zeller of Mannedorf, Dr. Cullis of Boston, A. B. Simpson of New York, 'Dr.' Alexander Dowie of Chicago, and the two 'tramp' Divine healers, Francis Schlatter and Schrader.

Among the places at which faith cures have been specially numerous are Lourdes in France and the church of Sainte Anne de Beaupré in Quebec.

The most ardent advocates of faith cure disagree in the fundamental points of the theory. Some assert that all disease is the result of sin and the work of the devil. Others insist that sickness is often a blessing sent by God. Some maintain that the cure is dependent solely upon the faith of the afflicted; others believe that the prayer of friends, though absent, may be sufficient. Some hold that no drugs, surgery or material means should ever be used and that even the anointing with oil and the laying on of hands, where these are permitted, are only symbolical, having no curative power in themselves; others claim that all known means should be employed and that only after this is done will prayers be effective. Some believe that every disease can be cured and immediately, where the faith is sufficient; others hold that it is frequently God's will that certain persons should endure their afflictions and that a cure may be delayed or withheld. A few affirm that all who believe that they are healed are thereupon healed and should so express themselves even though all the symptoms of the disease remain; others assert that it is false and blasphemous to claim to be healed when there is no evidence of cure.

Notwithstanding the diversity of theories the practice of faith healing is remarkably uniform. But few employ anointing with oil or the laying on of hands. All make use of intense excitement and religious zeal. The personality of the healer is usually mysterious and this effect is often heightened by an assumption of dress and expression similar to that of Jesus as He was depicted by the Mediæval artists. The patients are overcome with awe at the presence of the healer, the grandeur of the temple, the unity of desire of the multitude, or some kindred agency. The actual results secured from the various applications of faith cure differ only in numbers. The experiences of those benefited by various healers and by various methods are identical. The reality of many of the results alleged for faith cure is admitted by most competent authorities. Among the diseases thus cured or relieved are numerous functional diseases and such as depend primarily upon the nervous system. Those who do not accept the teaching of faith cure are almost unanimous in denying the reality of the alleged cures of organic diseases. Scientific investigation seems to show that the best attested results secured by faith cure are such as are attained by various forms of mind cure and the opponents therefore insist that the explanation of the results secured by faith cure is the same as that of the other forms of mind cure. See MIND CURE.

FAITH-ENROLLE, n.: in *law*, a deed enrolled as a bargain and sale of freeholds.

FAITHFULL, *fāth'fûl*, EMILY: reformer: b. Headley

rectory, Surrey, Eng., 1835–1895, June 3; dau. of Rev. Ferdinand F., of the Established Church. She was educated in a Kensington school, and after her 20th year passed some time in the enjoyment of the social life in London, till, becoming interested in the condition of women, she applied herself to extending their sphere of labor. Her first efforts culminated in a large printing establishment, in which women were employed as compositors. In 1860, Queen Victoria, who had watched her labors with interest, gave her approval to the enterprise; and when presented with the *Victoria Regia*, an elegant specimen of workmanship wholly produced in the establishment, she allowed the concern to be styled the 'Victoria Press,' and appointed Miss Faithfull printer and publisher-in-ordinary to her majesty. In 1863, May, Miss Faithfull started *The Victoria Magazine*, monthly, in which she earnestly set forth her views and the claims of women to remunerative employment. She published a novel *Change before Change*, 1868, and *Three Visits to America* 1884.

FAITHORNE, *fā'thorn*, WILLIAM: eminent English engraver; b. London, in the early part of the 17th c.; d. 1691, May. He was a pupil of Mr. (afterward Sir Robert) Peake, printer and printseller. On the outbreak of the civil war, he followed his master, who had taken up arms for King Charles. Both were taken prisoners at Basing-House. Faithorne was sent to London, and imprisoned in Aldersgate, but after some time was released, and went to France, where he increased his proficiency in the art of engraving. Faithorne engravings are mostly portraits. Walpole has given a list of them, including portraits of 'Thomas Hobbes,' ætat 76; 'Henrietta Maria;' 'Cromwell;' 'Prince Rupert;' 'Sir Thomas Fairfax;' and 'John Milton,' ætat 62. Faithorne published in 1662 a treatise on engraving, dedicated to his old master, and entitled *The Art of Graveing and Etching, wherein is expressed the true Way of Graveing in Copper. Also the Manner and Method of that famous Callot and M. Borse in their several Ways of Etching.*

FAKE, or FAIK, n. *fāk* [Scot. *faik*, a fold, a plait]: the single coil of a rope or cable when the coils are laid on, or are close to, each other; or as in the case, of slate-stones, whose leaves or layers rest upon each other, and can be easily separated; in *Scot.*, a miner's term for sandy *shales* which split up into layers: V. to coil loosely, so as to be ready for use, a line, a rope, or a cable; to fold or tuck up. FAK'ING imp. FAKED, pp. *fākt.*

FAKE, v. *fāk* [Gael. *faigh*, to get, to acquire]: in *thieves' slang*, to acquire; to lay hold of; to steal: n. a counterfeit, a cheat, a pretence. FAKE'MENT, n. a begging petition. FAKER, n. *fā'kėr*, one who steals anything; a pickpocket.

FAKIR, sometimes FAQUIR, n. *fă-kēr'* [Ar. a poor man]: member of an order of mendicants or penitents, chiefly in India and the neighboring countries. The origin of Fakirism, an institution which reaches to the most remote antiquity, is lost in mythical darkness. The com-

mon account of the son of a mighty rajah, who, expelled from his home and country by the cruelty of his father, made a vow, half in revenge, half in contrition, henceforth to roam a beggar through the world, and to win proselytes to a life of poverty and self-mortification, as the one most befitting in man, and most pleasing to the Deity, cannot be called historical. The same yearning for rest, for peace, and pious contemplation, for escape from the noise and turbulence of the world, which has everywhere and always led still and pensive minds into seclusion, must naturally have been more powerful in a land which yielded almost of itself, and in abundance, all that was necessary for the sustenance of man—in a climate of flower and sunshine, where a hermit's calm retreat might easily rise before the weared eye in the hues of Paradise. But constant seclusion and ceaseless meditation there, as elsewhere, produced sad results. Inward piety is no longer enough; sanctity established through outward observances is the goal. Thus, abstinence becomes mortification and self-torture; mental repose, mystic self-absorption, or frenzied exaltation. This leaning of the Hindus to a life of asceticism was fostered by their primeval religion, which enjoins various exercises of penance and mortification on the three higher castes in general, but upon the Brahmins in particular. These, having passed through different stages of regeneration, end by becoming Sanyassis ('who have left everything') and are dead to the law. The world and its usages have no more any claim upon them; even religious ceremonies are no longer necessary to the 'United with God.' They go naked, or in filthy rags, receive the meanest food only, and that without either demand or thanks. Their ethical code consists in the observance of truth, chastity, internal purity, constant repentance, and contemplation of Deity. After these models Fakirism seems chiefly to have been framed, and its adherents were not only pious men, but occasionally were reputed saints, workers of miracles, and healers of all ills, especially epilepsy and sterility. The halo which from the first surrounded Fakirism, and the ready homage offered by the people, attracted to its ranks, at a very early date, many whose motives were impure, and who, under a garb of humility and mendicity, collected fabulous treasures. Strabo distinguishes these vagabonds from the more honest members of their class, and if we may trust the travellers of our own day, the more respectable element has now altogether disappeared. Their number is variously stated. In the time of Tavernier's visit, there were more than 1,200,000 Hindu, and 800,000 Mohammedan fakirs in the E. Indies, and their present number is said to exceed 3,000,000. Papi describes the Mohammedans as guilty of the greater follies. At times, especially in their return from distant pilgrimages, they are even dangerous, as the killing of an unbeliever is supposed an infallible introduction to the glories of paradise. They live either separately as hermits or solitary mendicants, or unite in large gangs, carrying arms and a banner, beating drums, and sounding horns as they approach a town or

village. Their appearance is disgusting in the extreme; they go naked, besmeared with the dung of the holy animal, the cow. Some bedeck themselves with the skins of serpents, some with human bones; others array themselves in the garb of women. Their fearful shrieks, and the hideous rollings of their eyes, add to the disgust of their appearance. Imitating madmen, they generally end by becoming madmen. The height to which self-torture is frequently carried by these wretched fanatics and of which we meet with signs even so far back as the Ramayana, in which a penitent is described as perpetually sitting with upraised arms between four fires, the sun forming the fifth, is so appalling that human nature shrinks from the mere description. Some pass their whole lives in iron cages, laden with heavy chains; some clench their fists till their nails grow through the hand; others hold aloft both their arms till they become like withered branches; while others, again, tie their hands and feet together, and roll head over heels for thousands of miles.

FAKOFO, n. *fä-kō′fō*, same as Baroko, which see.

FALABA, *fâ-lâ′bâ:* fortified town of Senegambia, cap. of Sulimana, w. Africa; on the Fala river; 190 m. n.w. of Freetown, 215 m. n.e. of Sierra Leone. The fortifications consist of a high stockade, with a moat 20 ft. wide and deep, which surround the town. The houses are built of clay and arranged in clusters round courtyards. Falaba was founded by the Sulimas, a tribe of the Mohammedan Foulas, who revolted and became masters of the neighboring villages and country. It was visited by Maj. Laing 1825, and Winwood Reade, 1869, both of whom wrote descriptions of the town and its people.

FALAISE, *fâ-lāz′:* town of France, dept. of Calvados, on a lofty platform bordering on a precipice, or *falaise*, whence its name. It is on the Anté, a feeder of the Dive, 22 m. s.s.e. of Caen. It has three suburbs, one Guibray, a mile to the e. rivals the town itself in size and population. The buildings of interest are the ecclesiastical edifices, the hospital, the public library, and, more than all, the old and ruined castle, once the seat of the dukes of Normandy, and the birthplace of William the Conqueror. In the castle, the chamber in which the Conqueror was born is still shown, as well as a tower called 'Talbot's' Tower, supposed to have been built by Talbot when lord warden of the district, after the capture of Falaise by Henry V. of England. Falaise has manufactures of cottons, hosiery, and bobbinet. At Guibray, an important annual fair is held Aug. 10–25, at which great numbers of horses and cattle are sold. Pop. (1901), 7,657.

FALASHAS, *fâ-lâ′shas:* body of Jews occupying the high regions of Samen and the plains along Lake Tzana, Abyssinia. Their origin is uncertain, though many authorities believe they are not natives of the locality, from their name, which means exiles or wanderers. According to their

own traditions, however, they are descendants of the tribe of Levi and settled in Abyssinia in the days of King Solomon. They inhabit principally the provinces of Samen, Wogara, Armatshoho, Walkait, Tchelga, Dembea, Tenkel, Dagusa, Alafa, Kunsula, Aschafer, Agarv-Meder, and Quara; observe the Jewish modes of life; and differ from other Jews in personal appearance and the belief that commercial transactions are virtually forbidden in the Mosaic law. They have no knowledge of either the Babylonian or Jerusalem Talmud, do not use the *tephilin* nor observe the feast of Purim nor the dedication of the temple, and are ignorant of Hebrew; but possess in Ethiopic a variety of religious rules and instructions such as the canonical and apocryphal books of the Old Test., a vol. of extracts from the Pentateuch with God's comments to Moses on Mount Sinai, laws governing the Sabbath, lives of the prophets, and a translation of the writings of Josephus. They observe with extreme rigor the Sabbath, which has been deified and as the goddess *Sanbat* receives both adoration and sacrifice. They are so afraid of giving offense that they will not dress themselves on that day. A limited superstition prevails among them, the *Ardit*, a book of secrets revealed to 12 saints, being used as a charm against disease. They are handsomely formed, of medium height, with oval faces and long curly hair. While religiously averse to engaging in commerce, they are exceedingly industrious, cultivate the soil, manufacture pottery, iron ware, and cloth, and have great skill as architects and masons. They are exempt from military duty on account of their scruples against shedding human blood, though during the war between Great Britain and Abyssinia 1868, many of them distinguished themselves as warriors under King Theodore. The F. were independent and governed by their own princes till the beginning of the 19th c., when they were conquered by the Amharas, and have since been under the rule of the princes of Tigré. They number abt. 250,000.

FALCADE, n. *făl-kād'* [F.—from L. *falx*, a sickle, a hook]: a falling sharply on the haunches, as a horse.

FALCARIOUS, a. *făl-kār'ĭ-ŭs* [L. *falcarius*—from *falx*, a scythe, a sickle]: in *bot.*, plane and curved with the edges parallel.

FALCATE, a. *făl'kāt*, or FAL'CATED [L. *falcātus*, scythe-shaped—from *falx*, a reaping-hook: It. *falcato*]: in *bot.*, bent or shaped like a reaping-hook; crescent-shaped. FALCA'TION, n. *-kā'shŭn*, the state of being crooked as a sickle; a bending in the form of a sickle. FALCIFORM, a. *făl'sĭ-fawrm* [L. *forma*, shape]: shaped like a reaping-hook.

FALCHION, n. *fawl'shŭn* [It. *falcione*, a scimitar—from mid. L. *falcĭōnem*, a sickle-shaped sword—from L. *falcem*, a reaping-hook: F. *fauchon*, a small scythe: comp. Gael. *fal*, a scythe, a spade]: a short crooked sword; a scimeter: see SWORD.

FALCIDIAN LAW, *făl-sĭd'ĭ-an:* statute proposed by the Roman tribune Falcidius, and enacted during the reign of

Augustus in the year of Rome 714. It gave power to fathers of families to bequeath three-fourths of their property by will as they pleased, but prohibited their giving away the other fourth, termed the Falcidian portion, which was to descend to the heir The same principle prevailed in England in early times, and is still observed in several states of the American Union. At common law no such testamentary restrictions exist.

FALCK LAWS (against Papal claims): see GERMANY.

FALCON, n. *faw'kn* [F. *faucon;* OF. *faulcon*—from mid. L. *falcōnem;* It. *falcone,* a falcon—from L. *falx,* a reaping hook]: a hawk trained for hunting—so named from its hooked beak. FALCONER, n. *faw'kn-ėr,* one who trains or sports with falcons. FALCONRY, n. *faw'kn-rĭ,* the art of training or hunting with hawks. *Falcon* in the Linnæan zoology, genus of birds, including all the diurnal birds of prey, now known as the family of *Falconidæ* (q.v.); but in its present use as a generic name, limited to nearer accordance with its popular use, as a designation of those species which, in the language of falconry, were styled *noble birds of prey.* The true falcons are characterized by a bill curved from the base, the upper mandible hooked at the point, and the cutting edge of the upper mandible furnished with a strong projecting notch, or *tooth.* The claws are sharp, curved, and strong; and in accordance with all this powerful armature, the whole frame is very robust and muscular. The legs are rather short, and have great power in striking or seizing prey. The keel of the sternum (breastbone) is very large, and adapted for the attachment of powerful muscles; the furcula and coracoid bones (see BIRDS) also are very strong, to afford a sufficient resisting base for very powerful action of the wings. The wings are long and pointed, the first and third quill-feathers of equal length, the second rather the longest, the first and second quill-feathers emarginated near the tip. The true falcons are bolder in proportion to their size than any other Falconidæ —even eagles. Their acuteness of vision is wonderful; and they have very great powers of flight. A F. is known to have traversed the distance between Fontainbleau and Malta, not less than 1,350 m. in 24 hours. The speed attained by a F. in pursuit of its prey has been calculated to be at the rate of 150 m. an hour. They soar to a prodigious height in the air, always endeavoring to outsoar any bird of which they may be in pursuit, and to swoop down upon it from above; though it is far more difficult for them to rise vertically in a calm atmosphere than for birds of short and rounded wing, and they either rise obliquely—often also making their onward flight in a series of arcs—or avail themselves of the wind, and by flying against it, are borne aloft as a boy's kite is. The species are numerous; some are of very wide geographic distribution, while others are peculiar to certain countries or climates. Among the species are the GYRFALCON (q.v.), or Jerfalcon (*F. Gyrfalco*); the Iceland Falcon (*F. Islandicus*); the Greenland Falcon (*F. Grenlandicus*); the PEREGRINE F. (q. v.) (*F. peregrinus*),

of which the female is *par excellence* the Falcon of Falconers (see FALCONRY), and the male is the Tercel, Tiercel, or Tercelet; the HOBBY (q.v.), (*F. subbuteo*); the Red-footed Falcon or Red-legged Falcon, (*F. sufipes*), a small species, much resembling the Hobby; the MERLIN (q.v.), (*F. æsalon*); and the KESTREL (q.v.), or Windhover (*F. tinnunculus*). For the species chiefly used in falconry, see FALCONRY.

The first three mentioned and the Labrador Falcon (all native in N. Amer.), are thought to be possible varieties of one species. These (all very large, with tarsus narrowly bare behind), the Peregrine, and the Lanner or Prairie Falcon (*F. mexicanus*), grayish brown above (a. w. species), and the Pigeon and Sparrow Hawks, represent the genus *Falco* in N. America.

FALCON, *fâl-kōn'* (formerly CORO): irregular-shaped province of Venezuela, S. Amer.; bounded n. and e. by the Caribbean Sea, s. by the provinces of Carabobo and Barquesimeto, w. by the province of Maracaybo; 11,250 sq. m. Its surface is diversified, though chiefly a low plain; the Sierra de Coro attains an elevation of 4,250 ft. in the interior; and while the soil in general is neither fertile nor adequately watered, the highest parts of the mountains are covered with fine forests. Products: cattle, coffee, cacao, cotton. Cap. Coro. Pop. about 225,000.

CORO, or SANTA ANNA DE CORO, town, cap. of the province of Falcon, is near the Caribbean Sea and the isthmus connecting Paraguana with the mainland. Pop. about 9,000.

FALCONE, *fâl-kō'nā*, ANCILLO: 1600–63; b. Naples: Italian battle painter. A fellow-student of Salvator Rosa at Spagnoletto's studio, he himself subsequently became the founder of an academy of much resort. In accordance with his turbulent impulsive nature, he flung himself into the political struggles of the times, and during Masaniello's outbreak, organized his numerous scholars and dependants into a secret band, which inflicted deadly retaliation on the Spaniards. On the suppression of the insurrection, Falcone fled to France, but returned to Naples, where he died. His works are few and costly; they are prized for extreme fidelity to nature, as much as for harmony and brilliancy of color, and variety of expression.

FALCONER, *fawk'nėr*, or *faw'kėn-ėr*, WILLIAM: 1732–69: b. Edinburgh; one of a family of whom all, excepting himself, were deaf-mutes. He went early to sea, serving his apprenticeship on board a merchantman; and before he was 18 years of age he was second mate, in a vessel in the Levant trade, which was shipwrecked off Cape Colonna, himself and two others being the only ones of the crew saved. He published *The Shipwreck* 1762, and during the next year entered the navy as midshipman in the *Royal George*. When peace came, he resided in London, where he wrote a satire on Wilkes, and compiled a *Nautical Dictionary*. He sailed 1769 Sep., as purser in the *Aurora* frig-

ate; reached the Cape of Good Hope in Dec.; and perished with his companions—the *Aurora* having gone down—in the Mozambique Channel. Falconer wrote several poems, but *The Shipwreck* is the one on which his fame rests. It abounds in nautical language, and has the rare merit of being interesting. It is not a great poem, but has always had readers and admirers. In the second ed., the author added the characters of Albert, Rodmond, Palemon, and Anna—characters bearing the same relation to actual sailors that Alexis and Chloe bear to actual shepherds and shepherdesses—and to some extent destroyed that singleness of impression which was the chief merit of his work.

FALCONET, n. *făl'ko-nĕt* [F. *falconette*, dim. of OF. *falcon*]: in *zool.*, a little falcon; name applied to a genus of tiny falcons, belonging to the sub-family *Falconinæ*, peculiar to the region of India, none being seven inches in length.

FALCONET: name in the 15th and 16th c. for the smallest class of cannon. The ball weighed from 1 lb. to 3 lbs., and the gun from 5 cwt. to 15 cwt.

FALCONIDÆ, *făl-kŏn'ĭ-dē:* family of diurnal birds of prey (see ACCIPITRES), corresponding with the Linnæan genus *Falco*, and exhibiting those characters of muscular vigor, armature of beak and talons, and power of flight, found in their highest perfection in the true Falcons (q.v.), and in scarcely inferior degree in the Eagles (q.v.). The species are numerous; the British Museum alone contains specimens of almost 200 unquestionably distinct species; but very many supposed species have been named and described by ornithologists, which have been ascertained to owe their distinctive characters merely to age and sex. The female is generally larger than the male; and the plumage of the young different from that of the adult. There are, in the different groups, considerable diversities in the curvature and strength of the bill, which has the cutting edges of the mandibles either notched, festooned, or plain; the legs and toes also exhibit diversities as to length, strength, feathering, etc.; and in some groups, the wings are much longer and more pointed, than in others. This is so particularly with the true falcons, as contrasted with eagles, hawks, buzzards, kites, harriers, etc., and, in the language of falconry, the former—having the second quill-feather longest, and the first nearly equal to it—are called *noble birds of prey* (see FALCONRY), being those usually domesticated and trained for the service of man; the latter—having the fourth quill-feather longest, and the first very short—are called *ignoble birds of prey*, even eagles receiving this designation. The Falconidæ are distributed over all parts of the world; and almost all kinds of vertebrate animals except the largest quadrupeds, are the prey of some of them. Some also devour insects. Like the *Felidæ* among ravenous quadrupeds, the Falconidæ do not willingly feed on carrion, but generally seize and kill their prey. As in

FALCONS.

1. Goshawk. 2. Marsh Hawk. 3. Pigeon Hawk or Merlin. 4. Fish Hawk.
5. Saker Falcon.

the *Felidæ*, also, there is a provision for the preservation of the claws from being blunted by unnecessary contact with the ground or with any hard substance, the Falconidæ contracting the toes so as to elevate their claws. The Falconidæ generally live in pairs.

The Amer. sub-families of Falconidæ are the *Circinæ*, harriers, face with an owl-like ruff—our species being the Marsh Hawk; *Milvinæ*, kites, bill weak, tail forked or else much shorter than the long, pointed wings—examples, Everglade Kite, Mississippi Kite (s. and n. in the great valley), Black-shouldered or White-tailed Kite and Swallow-tailed Kite (same range); *Accipitrinæ*, hawks, long tail and legs, bill high at base, strong, toothless—examples, Sharp-shinned Hawk, Cooper's or Chicken Hawk, and American Goshawk, sometimes called the Blue Hen Hawk and the young called Chicken Hawk; *Falconinæ*, falcons, both mandibles toothed, the end of the lower truncated—for examples, see FALCON; *Polyborinæ*, caracaras, terrestrial in habit, feeding much on carrion—one example, the Common Caracara of Florida to Lower California: *Buteoninæ*, buzzards and eagles, cutting edge of bill only lobed or festooned—embracing the Harris's, the White-tailed, the Cooper's, the Harlan's (Black Warrior), five Red-tailed, two Red-shouldered or Winter (sometimes called Chicken Hawk), the Band-tailed, the Swainson's or Common, the Broad-winged, Rough-legged, Fuliginous, Ferruginous, Star, Gray Star, two Anthracite, the Clawed, and Gruber's Buzzards, and four Eagles; here mentioning only American species. The Fish Hawk or Osprey, probably the one and only cosmopolitan species, stands for a separate family, *Pandionidæ;* it visibly differs in close, firm plumage and immensely strong feet, both adapted to its fishing habit.

The Lammergeir (q.v.) connects this family with the Vultures; the Secretary (q.v.), while in many respects agreeing with the Falconidæ, is peculiar in some of its characters. The American vultures are very different from those mentioned, and are made a sub-order, *Cathartides;* they resemble turkeys in appearance, e.g., the turkey-buzzard; the only resemblance to the old-world vultures is in carrion-feeding; the confusion of names is unfortunate. True vultures may be regarded as a sub-family of Falconidæ.

FALCONRY, *faw'kn-rĭ:* the term applied to the art of training certain of the falcon tribes to the pursuit and capture, on the wing, of birds such as the heron, partridge, lark, rood, magpie, wild-duck, pigeon, etc. In ancient times, this sport was called HAWKING, a term still preserved in many places, and, perhaps, more strictly correct. In present usage, *Falconry* is the term applied to the sport and all that pertains to it: *Hawking* to its actual practice in the field. Falconry is of very ancient origin, and has been traced back, as an Eastern sport, to a period anterior to the Christian era. In Britain it seems to have been followed before the time of the Heptarchy; and in the celebrated

Bayeux tapestry, Harold is figured with a hawk upon his hand. It seems, however, to have been practiced in Eastern countries, and in central Europe, long before it became established in Great Britain; and to such a height did the sport reach in Germany, that nobles, and even kings, seem to have devoted to it the greater part of their time. As an instance of this, Emperor Frederick II. of Germany was a passionate admirer of the sport, and is said to have written a treatise on Falconry, published by J. G. Schneider, 1788 (2 vols. Leip). In England, after the Norman Conquest, Falconry seems to have rapidly advanced, being much indulged in by kings, nobles, and ladies; and in those days the rank of the individual was indicated by the particular species of hawk carried on his wrist. Thus, an earl carried a Peregrine Falcon. In the 17th c., the sport declined; in the 18th c. it partially revived, but again fell off about 1725, when the art of shooting birds on the wing came into fashion. In the present day, an attempt is being made in several quarters in England, with some success, to restore this sport. In India, Persia, and other Eastern countries, Falconry is still eagerly practiced, the methods there followed being nearly similar to those of Great Britain.

In Falconry, two distinct kind of hawks are used—the long-winged or true falcons, and short-winged. The first (noble birds of prey) are represented by the Gyrfalcon and Peregrine; the second by the Goshawk and Sparrow-hawk; and though for certain purposes the male is superior, as a rule the *females* of each species are much more highly esteemed for sporting purposes, from their being larger and more powerful. 'Long-winged' hawks may also, as a rule, be distinguished from the 'short-winged,' by their having a 'tooth' or notch on the upper mandible; from the second feather of the wing being either longer, or as long, as the third; and from their impetuous 'stoop' at their prey.

The Gyrfalcon (q.v.) is the largest species, but from its extreme rarity in the British Islands, is seldom used. The Peregrine Falcon is the bird in greatest favor with falconers, and if taken from the nest, as is usually the case, and carefully trained, affords better sport than any other British species. The remarks which follow refer to the sport as practiced with this bird.—No hawk is fit for sporting purposes until it has undergone a careful process of training. The young hawk is more easily trained than one grown, caught in a wild state; but in either case, a number of operations require to be gone through before the sportsman ventures to take his falcon into the field. Taken from her nest on some high and dangerous cliff when nearly fledged, the *eyass*, or young falcon (with her companion-fledglings, usually two in number), is carefully conveyed to the falconer's home; there she is kept in an open shed in a nest of straw, and fed several times a day on fresh beef, with an occasional change to birds or rabbits. At this somewhat critical period, she should never be handled, except to put on the *jesses* and *bells* (see Fig. 1), which

afterward become permanent fixtures. Her powers of flight, too, being as yet very limited, she depends upon her master for regular supplies of food, and soon learns to come for her meals at his call. Her meat is usually fixed to an

Fig. 1.—Leg and Foot of Hawk, showing the method of attaching the Bells and Jesses.

a, the end of leash; *b*, *b*, the jesses; *c*, the bell; *d*, the bewit; *e*. the varvels of silver, with owner's name and address engraved.

apparatus termed the *lure* (see Fig. 2), and thus the hawk is early accustomed to that important instrument, the further uses of which are explained below. By degrees her powers of flight are strengthened and she is permitted to fly at large (returning to the lure at her master's will to be fed, or in hawking language, to remain *at hack*) for several weeks, during which time her meals are gradually reduced to one a day. While at hack, she sometimes becomes wild, wanders far from home, and kills game for herself; and when this is the case, she is usually caught by enticing her to a bow-net, close to which a pigeon or some meat is fastened to the ground. After being 'taken up' from hack, she is kept at the *block* (see Fig. 3)—the stand upon which she sits—for a few days before her regular training begins. At this time, also, hawks require a bath twice or thrice a week.

Fig. 2.—The Lure.

The first of the principal operations in training is *hooding*, an operation which, if successfully performed by the trainer during his earlier efforts, prepares the way for overcoming many subsequent difficulties. It demands the greatest patience and the tenderest manipulation. The hood is a cap of leather (see Fig. 3), made to fit the head of the falcon in such a manner as totally to obscure the light, a simple aperture only being left, through which the beak

protrudes, and a slit behind, through which are passed the braces or ties that secure the hood to the head. By shutting out the light, the hood is serviceable in tending to make the hawk quiet and tractable, but to accustom the falcon to submit to its use requires much time and great management. When, after great perseverance, this is achieved, the hawk is said to be *'made to the hood,'* during which process she also learns to sit balanced upon the fist.

Fig. 3.—Hooded Peregrine Falcon on its block:

One end of the leash is attached to the Jesses, the other to a ring driven into the side of the block; and thus the hawk is prevented from escaping.

Besides tending to induce docility by hiding the light, the hood is of further service in shutting out from view any object which might cause the hawk to flutter or *bait* off the fist or *cadge* on its way to and from the field, etc. Hence the hawk is carried always hooded—the short-winged only being exempt. To the falcon's legs are attached two small hollow globes of thin metal, called *bells;* these are fixed to their place by leather straps called *bewits;* and both, to-

gether with the jesses, become permanent fixtures even during the bird's flights. *Jesses* are two leathern traps, five or six inches in length, attached to each leg immediately below the bells; the jesses, again, are themselves attached to another leathern strap, called the *leash*, about four times the thickness of a boot-lace (see Fig. 1), by two rings or *varvels;* and the bird being thus caparisoned, the falconer winds the leash through his fingers, and so prevents the falcon's escape while on his wrist. Instead of varvels, some falconers follow the Dutch plan of using a swivel; the former method, however, is now considered best. A long cord, called the *creance,* is further attached to the leash, and is used for the purpose of giving the bird greater freedom during her training than that afforded by the leash alone.

Fig. 4.—Tabur Stycke.

The *lure* is a bunch of feathers attached to a cord and tassel, and in the centre of the feathers is usually a piece of spliced wood, to which a piece of meat may be attached. By accustoming the hawk to feed off the lure, or to come to it at a certain call or whistle to be fed when on the wing, the lure becomes an important adjunct to the falconer's apparatus, as by it he is enabled to entice his bird back after an unsuccessful chase. On such occasions, the falconer reclaims his bird by swinging the baited lure round and round his head, accompanying the action by some well-known call. Four wings tied together make a good lure. The *tabur stycke* and *drawer* were formerly used for the same purpose as the lure, but were made in the form of a stick.

In Europe, hawks are carried on the left wrist (in the East they sit on the right); and to protect the falconer's hand from being injured by the bird's claws, a glove of stout buckskin leather is used. And here it may be remarked, that the claws and beak of wild caught or *haggard* falcons, are usually pared or *coped.* If the bird to be trained, instead of being a nestling, happens to be a wild one, the difficulties of training are immeasurably increased, and can be overcome only by days and nights of unwearying exertion. If it proves unusually restless and difficult to tame, it is kept on low diet, is prevented from sleeping for several days and nights, and has cold water poured upon it by means of a sponge, etc. By these and other means, the falcon gradually loses much of its restiveness, and submits to the processes of training.

For training the *eyess,* or young falcon to the lure, as preparatory to entering at game, Sir John Sebright says:

'Take the hawk out while very hungry, and let an assistant swing the lure round his head steadily, and at full length of the cord; upon this the falconer casts off his hawk with the usual whistle or halloo, still holding the *creance,* and the assistant suffers the lure to fall to the ground, for

fear of injury to the hawk, by striking it in the air with the two strings attached. When this lesson is perfect, the assistant, instead of suffering the lure to fall, withdraws it, and disappoints the hawk, which flies by him, and then returns, when he may be suffered to strike the lure and feed upon it. In process of time, the creance may be removed and the hawk enticed to the lure from a considerable distance, and may then strike it in the air (if the lure is a light one), while swinging round the head of the assistant. After a still greater time, the hawk becomes so perfect that she will circle round the head of the falconer, waiting for the lure to be thrown, and is then said to *'wait on'* perfectly. When the hawk is feeding on the lure, the falconer should encourage her, and suffer her to finish without alarm, by which she will be shown that she may do so without fear, and will readily suffer herself to be taken after flying. She should also be accustomed to horses, men, and dogs.'

Having 'made the hawk' to the *fist, the hood,* and *the lure,* she is next 'entered' at her game (the *quarry*). This is done by tying a long cord or *creance* to the varvels of the jesses, and flying the hawk from the hand at a bird thrown out to it, also restrained by a cord. The hawk is next flown several times without a creance at birds *shortened in their flight,* after which it is ready to be entered at wild quarry. In case of failure, however, a live bird, similar to that at which she is flown, should be carried to the field, and thrown out to her in a creance by way of encouragement.

The heron is, and always has been, a favorite object of pursuit in British Falconry, the period of the year best adapted for the sport being the breeding season. Having previously ascertained the feeding-place of that bird, the hawking party goes to the spot, usually toward evening, if possible in a direction *down-wind* from the heronry, so as to intercept the bird in its *up-wind* flight homeward. When a heron is seen to pass, a couple (a cast) of hawks are unhooded and 'cast off,' and the chase commences. The heron, seeing the falcons approach, disgorges its food, to lighten itself, and immediately ascends in the air; the hawks, eager in pursuit, and quicker of wing, speedily make upon it, and strive to gain a greater elevation by a series of beautiful gyrations. When one of the hawks succeeds in rising above the heron, it *stoops,* that is, descends swiftly, and in a direct line, upon the game, aiming a stroke with its outstretched legs and talons at its body; this the heron almost always succeeds at first in eluding, by a rapid and sudden movement aside. The second hawk, which also by this time has soared, then stoops, while the first is regaining its former altitude; and so on for many successive times, till one hawk at length clutches the heron or *binds,* upon which her companion joins her, and the three, buoyant by the motion of their wings, descend gently to the earth. The falconer's imperative duty is now to be up or near the spot where the three birds are descending, to divert the attention of the

hawks before they reach the ground, and entice them from the quarry to him, by means of live pigeons as lures. This is very necessary, as the heron is extremely dangerous, and has been frequently known to injure the hawks with its sharp beak when on the ground, though it is almost harmless in the air. When the heron's wounds have been dressed —for this bird is rarely killed in such encounters—a ring with the captor's name is usually affixed to its leg, after which it is set at liberty, and so becomes available for future sport. The falconer's usual cry of encouragement to his hawks upon the springing of the quarry is 'Hoohaha-ha-ha!' His cry when the quarry is killed, is 'Whoop!' A falcon takes its prey either by tearing or *raking* it with the *hind* claw of each foot at the instant of passing, or by clutching the victim with its talons, and when she thus succeeds in binding to her quarry, she slowly descends with it to the ground. The supposition that the hawk strikes its quarry with the beak or breastbone in its swoop, is a mistake.

Besides the Peregrine Falcon, the Merlin is trained for Falconry, and is extremely bold. This bird, however, is flown at small game, chiefly larks. The Goshawk, though it does not soar and stoop; flies direct at its game: it is used chiefly for pheasants, rabbits, hares, etc., in an inclosed country. The Sparrow-hawk, from its extreme boldness, is a great favorite, but is flown at smaller birds only, such as blackbirds, thrushes, etc. The Hobby is seldom or never used.

The following are the principal terms in falconry. A falcon's legs, from the thigh to the foot, are termed *arms;* toes, *petty singles;* claws, *pounces;* wings, *sails;* trail, *train;* crop, *gorge;* lower stomach, *pannel;* feathers, hair, etc., ejected at the mouth, *the castings.* A young hawk from the nest is *an eyess* or *eyas;* one that can hop, but not fly well, *a brancher;* a nestling hawk reared at liberty is a *hack-hawk;* a young hawk able to take game, a *soar-hawk;* a mature wild hawk is a *haggard* or *blue-hawk;* young hawks taken in their migrations, are *passage-hawks,* or *red hawks*—the term *red* being applied merely as a title of distinction between the young hawk and the eyess or nestling, the colors of the two being in reality the same. The training of the passage-hawk and haggard is termed *reclaiming;* fluttering, is *baiting;* fighting with each other, *crabbing;* sleeping, *jouking.* The prey is termed the *quarry.* When the hawk strikes her quarry in the air and clings to it, she *binds;* when she flies off with it, she *carries;* when she plucks it, she *deplumes.* Dead game is *the pelt. Stooping* or *swooping* is the act of descending with closed wings from a height at prey. Direct flight, without soaring, is *raking off;* changing from one bird to another, *checking.* When game flies into a cover it *puts in.* When the hawk is moulting her feathers, she is *mewing;* after her first moult, she is *intermewed;* with complete plumage, *summed:* when in good condition, she is *enseamed;* when out of condition, *seamed.* Mending the feathers artificially (an operation

frequently performed when one has been accidentally broken) is termed *imping;* blunting bill and talons, *coping.* When the falcon is obediently flying round in the air, she *waits on her master;* flying long-winged hawks from the wrist, is termed *flying out of the hood;* a couple of hawks is a *cast.* The *cadge* is a frame of wood with four legs. It is carried by means of straps, which pass over the bearers. (the cadgers') shoulders, and is used, when there are several casts of hawks to be taken to the field. The *block* (see Fig. 3) is a round piece of wood, such as would be made by sawing a foot of wood out of a felled larch-tree of 20 years' growth; and upon this the hawk sits when out of doors, Through the bottom of the block runs an iron spike, which being driven into the ground, secures the block to its place, and so prevents the hawk from dragging it away. Falcons are very pugnacious, and if not carefully kept separate, would soon kill each other. The *screen* or *perch* is a perch guarded by a falling piece of canvas, to support the hawks in case of their leaping down; upon this, the hawks are placed at night in an apartment called the *mews.*

The best works on the subject are those of Tuberville and Latham, respectively, as old treatises; and that of Sir John Sebright, as comparatively modern. Of the more recent treatises, *Falconry in the British Isles,* by Salvin and Brodrick; and *Falconry, its Claims and Practice,* by Freeman and Salvin, are standard. See also Stonehenge's *British Rural Sports* (Lond., Warne & Co.).

The village of Falconswaerd, near Bois-le-Duc, in Holland, has for many years furnished falconers to almost all Europe. Sir John Sebright says: 'I have known many falconers in England, and in the service of different princes on the continent, but I never met with one of them who was not a native of Falconswaerd.'

FALCULA, n. *făl'kū-la* [L. dim. of *falx,* a sickle, a scythe]: in *zool.,* term applied to a claw that is compressed, elongated, curved, and sharp-pointed.

FALDAGE, n. *fawld'ĭj* [Low L.—from *falda,* a fold]: in *feudal law,* privilege which anciently several lords reserved to themselves of setting up folds for sheep, in any fields within their manors. FALD-FEE, n. *-fē,* in *feudal law,* a composition or fee formerly paid by tenants for the privilege of faldage.

FALDERALS, n. plu. *făl'dėr-âls* [Sp. *faldilla,* a little fold or skirt; *falderilla,* a little lap]: the small pieces made to ornament a woman's dress, especially when it is loose and in excess; gewgaws; idle fancies or conceits.

FALDSTOOL, n. *fawld'stôl* [OF. *faudesteuil*—from mid. L. *fauldistōlĭŭm* and *faldistōrĭŭm*—from O.H.G. *faldan,* to fold; *stual,* a stool: AS. *fald,* a fold, and *stool*]: the low desk at which the Litany is said in churches; the chair of a bishop within the rails of the altar. FALD'ISTORY, n. *-ĭs-tėr-ĭ,* a kind of stool on which the king may kneel at his coronation at the south side of the altar; a folding chair.

FALEME, *fâ-lā'mā:* one of the most important tribu-

taries of the Senegal (q.v.), into which it falls, lat. about 14° 40′ n., and long. 11° 48′ w. Its course has not been fully explored.

FALERII, *fâ-lē′rĭ-ī:* city of ancient Etruria, w. of the Tiber, n. of Mount Soracte. Its earliest historical appearance is B.C. 437, when, according to Livy, the inhabitants (called Falisci) joined with those of Veii in assisting the Fidenates against the Romans. The Falisci were among the most dangerous enemies of Rome, and were the last of the Etrurians who submitted to its power. Their city was at last destroyed by the Romans (B.C. 241), and they themselves were compelled to choose a new site a few miles off. Here a Roman colony was settled in the time of the triumvirs, whence the place took the name of *Colonia Junonia Faliscorum.* But this Roman Falerii does not appear to have ever acquired any importance, for the temple which anciently attracted so many pilgrims, stood on the site of the older town. During the middle ages, however, a new city sprang up on the ruins of the Etruscan Falerii, which finally obtained the name of *Civita Castellana* (q.v.). Ruins of the Roman or later Falerii, consisting of a part of the ancient walls, are still visible.

FALERNIAN, a. *fă lėr′nĭ-ăn* [L. *Falernus* (*Falernus Ager*), an ancient district of Italy in the n. of Campania, between the Massican Hills and the n. bank of the Vulturnus; famous for wine]: of or from Falernus; applied to a wine favorite among the Romans. It is described by Horace as, in his time, surpassing all other wines then in repute. In the time of Pliny, however, Falernian wine had begun to decline in quality, through lack of care in cultivation.

FALIERI, *fâ-lē-ā′rē,* MARINO: abt. 1284–1355, April 17: celebrated Venetian. He was elected 1354, at the age of 70, Doge of Venice, the third of his name called to this supreme dignity. At the siege of Zara, 1346, he defeated an army of 80,000 Hungarians, vigorously carrying on at the same time extensive siege-operations; and in the course of the war, having assumed command of the fleet, captured Capo d'Istria. Subsequently, he became ambassador of the Republic to Rome and Genoa. Of an ungovernable and implacable temper, his bitter resentment seems to have been roused by a grossly offensive libel on his fair and youthful wife, the author of which, a young patrician named Michele Steno, owed some grudge to the doge. The punishment awarded to the young noble by a patrician tribunal seemed to Falieri wholly inadequate to the offense by which his ducal dignity had been outraged, and in order to avenge this double slight, he organized an audacious plot, with the object of overthrowing the republic, and massacring the heads of the aristocracy, to be followed by his own assumption of sovereign rights. The conspiracy was, however, revealed on the eve of its execution, and Falieri was arrested, and suffered death by decapitation. In the hall of the great council, which contains the portraits of

all the doges, the space allotted to that of Falieri is draped with a veil of sable, and bears the following inscription: 'Hic est locus MARINI FALETRO, decapitati pro criminibus.' A faithful representation of the plot, and of its chief confederates, is in Byron's drama *Marino Falieri*.

FALKIRK, *fâl'kėrk* (local pron. *faw-kėrk'*): Scottish parliamentary burgh, finely situated on rising ground in the midst of a populous mineral and manufacturing district in Stirlingshire, and overlooking an expansive 'Carse,' through which winds the river Forth. Falkirk consists principally of a long, irregular street, where there is an equestrian statue to the Duke of Wellington, erected by public subscription 1854. In 1859, a commodious Exchange was built; in 1868, excellent county buildings were erected, a new prison, and county police-office. A hall, with accommodation for various studies, was opened 1878, for the Falkirk School of Arts. In 1600, Falkirk was made a burgh of barony by King James VI., in 1646 a burgh of regality by King Charles I. In 1715, it passed to the crown by forfeiture. It has nine yearly fairs, extensive inland trade, various local manufactures, and charitable institutions. Its parish church—the Eglais Bhrec, Varia Capella, or Speckled Kirk of the chartularies and of local tradition—has one or two monuments of some antiquity, but was rebuilt 1810. The church, church lands, and barony belonged of old to the Abbey of Holyrood. Near Falkirk, 1298, Sir William Wallace made his masterly retreat from the disastrous battle (see FALKIRK, BATTLE OF), in which he lost his companions in arms, Sir John Graham and Sir John Stewart, both said to be interred in the parish churchyard. The inscribed stone alleged to cover the grave of Sir John Graham, is apparently more modern than his time. In 1746, the neighborhood of Falkirk was the scene of another battle, in which the royal troops were defeated by those of Prince Charles Edward. It is now noted chiefly for its cattle-trysts (cattle fairs), at which stock is yearly sold to the value of about £1,000,000. In the immediate vicinity are the Carron Iron-works. Falkirk is a station on the North British railway and has water communication by the Forth and Clyde canal. Pop. (1901) 29,280.

FALKIRK, BATTLE OF: between the English and Scotch; near Falkirk, Scotland, 1298, July 22. Wallace had followed up his victory over the English near Stirling 1297, by taking possession of some of the more important fortresses of Scotland. In the following year, King Edward, having returned from Flanders, summoned a great army to meet him at York, and marched northward to Roxburgh, thence along the e. coast of Scotland and the shore of the Firth of Forth. It was not till the day of the battle, that Edward saw his adversaries. The Scottish infantry, much inferior in numbers to the English, were arranged in four circular bodies on a small eminence near Falkirk, armed with lances and with bows and arrows.

The cavalry numbering only 1,000 men, were placed in the rear. This array was charged by the English cavalry. The Scottish footmen bravely withstood the onset of the English horse; but the cavalry, dismayed by the preponderating numbers of the enemy, rode from the field without striking a blow. Thus left without support, the spearmen and archers were compelled to yield, and the retreat became general. The loss on the Scottish side is said to have amounted to 15,000 men. The results of this defeat were, that the military power of Scotland, such as it was, was broken; and Edward returned to England master of all the important strongholds of the south.

FALKLAND, *fawk'land:* royal burgh of Scotland, county of Fife, at the n. e. base of the Lomond Hills, 22 m. n. of Edinburgh, 10 m. s.w. of Cupar. The e. Lomond Hill rises so abruptly behind the town as to intercept the rays of the sun from it for several weeks during winter. Falkland was in early times a manor of the Earls of Fife. It passed from them to the crown 1425, and was made a royal burgh by James II. 1458. Within the town are the remains of Falkland Palace—a large tower (in the same style as the n. w. tower of Holyrood) above a vaulted doorway leading into the courtyard, built about 1500, and two sides of a quadrangle, built between 1530–50, fine and interesting examples of Scottish architecture. The palace was a favorite residence of King James IV., and after his death 1513, his widow, the impetuous sister of King Henry VIII. of England, was here kept in restraint for a season. Here her son, King James V., died 1542. The last king who occupied the palace was Charles II., who passed a few days in it 1650. Of the more ancient castle in which David Duke of Rothesay, was imprisoned and starved to death by the Duke of Albany, 1402, no traces remain. The people support themselves mainly by handloom weaving. Pop. (1901) 809.

FALK'LAND, Lucius Cary, Viscount: born, it is believed, at Burford, in Oxfordshire, England, 1610: d. 1643, Sep. 20. He was educated first at Trinity College, Dublin —his father, Henry Cary, Viscount Falkland, being at that time lord-deputy of Ireland—and afterward at St. John's College, Cambridge. His earlier years were devoted to study, and to the conversation of learned men, among whom he himself seems to have occupied a first place. His residence (Burford) was only ten m. from Oxford with its scholarly company. Falkland is one of those historical personages whose character and abilities we must take, if at all, on the word of friends and panegyrists, like Clarendon; for his deeds and writings are not equal to his fame. In 1633, he was made one of the gentlemen of the privy-chamber to Charles I., and took part in the expedition against the Scots 1639. In 1640, he entered parliament as member for Newport in the Isle of Wight, and was at first distinguished by his patriotic zeal for the laws and constitution of his country. Against such men as Stafford

and Finch he used great severity of speech, though even in their cases his almost finical love of the forms of legal procedure was manifested. Shortly afterward he conceived it his duty to assume a different political attitude, and to oppose what he deemed the excesses and illegalities of the popular party. On the breaking out of the civil war, he consequently took part with the king, though mourning deeply the miseries which his country was about to suffer. He died a soldier's death at the battle of Newbury. Falkland was quite unfitted to take a practical part in the sanguinary politics of his time, but his love of the rights of the nation, which burned in him as strongly when a royalist as when attacking Stafford and the bishops, aids us to understand the deep indignation that possessed the English gentlemen who represented the commons, at the arrogant and unprincipled policy of Charles' advisers. Falkland wrote various treatises, etc., the principal of which is *A Discourse on the Infallibility of the Church of Rome.*

FALKLAND ISLANDS: the only considerable cluster in the s. Atlantic, about 300 m. e.n.e. of the Strait of Magellan, stretching in s. lat. from 51° to 52° 30′, and in w. long. from 57° 40′ to 61° 20′. After having successively belonged to France and Spain, they have, since 1771, formed part of the British empire; and in 1833 they began to be settled, being as a whole, the most southerly of the organized colonies of England. These islands number about 200, presenting a total area of about 6,500 sq. m. The two largest members of the group, E. Falkland and W. Falkland, comprise between them more than half the surface; and of the remainder, the chief ones are Great Swan, Saunders, Keppel, Pebble, Eagle, and Jason. This possession, with its many excellent harbors, is valuable mainly from its position with respect to the Southern and Pacific Oceans. Both the soil and the climate are much better adapted to pasturage than to cultivation. While the natural grass is extremely luxuriant, scarcely anything but a few vegetables is grown in the settlement. The coasts teem with fish, especially cod; and in certain seasons of the year, penguins and seals are killed in great numbers for their oil. The temperature is very different from that of the corresponding parallels in the s. of England, being both lower in summer and higher in winter. The mean of the former season is about 53° F., and of the latter, about 40°. These averages considerably exceed the vague estimates of early navigators who, coming suddenly down from the tropical heats, appear to have here felt, by comparison, something of hyperborean cold. Though there is no timber worthy of the name, yet peat abounds to the depth of ten ft. Revenue of the colony 1901, £15,476; expenditure, £17,639. The annual value of imports varied 1900–1 from £66,948 to £74,765; of exports (chiefly wool, with oil, hides, tallow, and seal skins), from £111,-539 to £108,294. There is some gardening near Stanley, the seat of government; and a little barley and oats is

cultivated. There is only one indigenous quadruped found, a kind of fox. Large cattle are now numerous. The sheep are chiefly Cheviots and Southdowns. There are deposits of guano on W. Falkland. The governor, the executive council, and the legislative council of the Falkland Islands are appointed by the crown. Pop. (1901) 2,043.

FALKNER, *fâk'nėr*, ROLAND POST, American statistician: b. Bridgeport, Conn. 1866, April 14. He was graduated at the University of Pennsylvania in 1885; studied economics at Berlin, Leipsic, and Halle-on-Saale, Germany; was instructor in accounting and statistics in the University of Pennsylvania in 1888–91, and professor of statistics in 1891–1900. He served also as statistician of the United States Senate Committee of Finance in 1891; as secretary of the United States delegation to the International Monetary Conference; and as secretary of the conference in 1892. He is author of numerous essays on criminology, sociology, etc.; was chief of the division of documents in the Library of Congress, and editor of *Annals* of the American Academy of Political and Social Science, chief commissioner of documents, Library of Congress, 1900–1904; and has been commissioner of education, Porto Rico, since 1904.

FALL, n. *fawl* [Icel. *falla;* Dut. *vallen*, to fall—connected with Gr. *sphallo*, I cause to fall]: the act of dropping or coming from a higher to a lower place; descent; that which falls; a tumble; ruin; apostasy; decrease of price or value; a rush of water down a steep place; autumn; in *OE.*, cadence: V. to drop or come down from a higher to a lower; to descend; to depart from the faith; to perish; to decrease in price or value; to flow into, as a river; to sink; to come in or upon; to forsake; to happen; in *OE.*, to bring forth. FAL'LING, imp.: ADJ. descending; drooping; declining. FELL, pt. *fĕl*. FALLEN, pp. *fawl'n:* ADJ. degraded; ruined; decreased. FALLIBLE, a. *făl'lĭ-bl* [L. *fallibĭlis*—from *fallĕrĕ*, to deceive]: liable to error or mistake. FAL'LIBLY, ad. *-blĭ*. FAL'LIBIL'ITY, n. *-bĭl'ĭ-tĭ*, liability to err or be deceived. FALLER, n. *-ėr*, one who falls; in *machinery*, an arm on a mule-carriage, operating the faller-wire, which depresses the yarns when the carriage is about to run back; also a bar in the flax spreading machine, to which are attached vertical needles, forming a comb or gills, which simulate the action of the human fingers in detaining to some extent the line as it passes to the drawing roller. FALLING-HOME, a. in *naut.*, term applied to the upper parts of the sides of a ship when they curve or slope inward. It is called also tumbling home, and formerly, too, hausing-in. It is the opposite of wall-sided or flaring-out. FALLING-OFF, n. degeneracy; change to the worse; in *naut.*, the opposite of *griping* or *coming-up* to the wind. It is the movement or direction of the ship's head to leeward of the point whither it was lately directed, particularly when she sails near the wind or lies by. FALL-CLOUD: same as STRATUS. FALL-POISON, in *bot.*,

name in the United States for a melanthaceous plant, *Amianthium muscætoxicum*, so called because cattle feeding on its foliage in the fall of the year are poisoned. FALLING-SICKNESS, epilepsy (q.v.). FALLING-STARS, the familiar name for meteorites seen in a state of combustion in the sky (see METEORS). FALLING-STONES, a familiar term for meteoric stones. To FALL ASTERN, among *seamen*, to be passed or left behind; to move or be driven backward, as by a current. To FALL AWAY, to lose flesh; to apostatize; to fade. To FALL BACK, to recede; to retreat. To FALL BACK UPON, to retreat for safety toward supports, as troops; to betake one's self to a reserved fund or a reliable resource for support. To FALL DOWN, to come to the ground; to prostrate one's self in worship. To FALL FOUL, to attack; to come into violent contact; to become entangled. To FALL FROM, to recede from; to depart. To FALL IN, to agree with; to enter among, as a body of soldiers arranged; to join. To FALL IN WITH, to meet with, as a ship; to discover. To FALL OFF, to withdraw; to forsake; to depreciate; to become less. To FALL ON, to begin suddenly and eagerly; to rush against. To FALL OUT, to quarrel; to happen; to quit the place in the ranks. To FALL OVER, to change sides. To FALL SHORT, to be deficient. To FALL TO, to begin; to apply one's self to. To FALL UNDER, to come under or within the limits of. To FALL UPON, to attack. THE FALL OF THE LEAF, autumn: see DECIDUOUS TREES: LEAVES. THE FALL, the state of sin and misery into which our first parents were brought by eating the forbidden fruit; the act itself; the autumn, when leaves fall.

FALL, n. *fawl* [F. *faille*, a fishing net]: a short veil worn over the bonnet by women; a veil.

FALL, n. *fawl* [O.Sw. *fale*, a pole or perch]: in *Scotland*, a measure nearly equal to an English perch or rod.

FALL, int. *fawl:* in *naut.*, the cry to denote that a harpoon has been effectively delivered into a whale.

FALL, DOCTRINE OF, in Theology: doctrine of the historical introduction of evil into the world, based on the narrative in Genesis, chap. iii., with other portions of the Bible which refer to the events there recorded. The doctrine assumes various forms, according to the interpretations which the record receives. Some theologians interpret the narrative more literally—though none do so quite literally;—others interpret it more figuratively as a poetic instruction; while others reject it altogether as a narrative, and look upon it merely as a mythical story of the early time—mirroring the lapse from a primitive golden age, or age of innocence.

1. Even the most orthodox theologians to some extent spiritualize the narrative, or regard it figuratively. The serpent, for example, is with them the devil, though the text in Genesis itself gives no hint of such an interpretation, which ultimately appears in the New Testament. The enmity between the serpent and the woman is the

enmity between the devil and mankind; and the bruising of the head and the heel is supposed to represent the victory—though not without suffering—of Jesus Christ, as the Messiah, over the devil. Other particulars, less important, are conceded to be figurative. The doctrine of the Fall, according to the prevalent interpretation of orthodox divines, is stated in the Westminster Confession of Faith, c, vi.: 'Our first parents being seduced by the subtlety and temptation of Satan, sinned in eating the forbidden fruit. By this sin, they fell from their original righteousness, and communion with God, and so became dead in sin, and wholly defiled in all the faculties and parts of soul and body. They being the root of all mankind, the guilt of this sin was imputed, and the same death in sin and, corrupted nature conveyed to all their posterity, descending from them by ordinary generation.'—This definition, however, probably asserts more than multitudes of believers in both the narrative and the doctrine, now deem it necessary or desirable to assert. They are not anxious to criticise the narrative as though it were a logical formal statement, and they have little care to classify it according to certain literary rules. Their ideas are not entangled in its mere garb or form. They take note of the main spiritual facts which it presents, and observing that these accord with all human history and experience, and that the most recent science gives some of them—e.g. the fact of heredity—increasing emphasis, they accept the main facts—the important meaning of the story; and thus accept the story as a true spiritual symbolism, and further, as true historically so far as its history is at all requisite for a vehicle of its deep truths. The *doctrine* of the fall which probably is the frequent result of such a view, may be generally stated thus: The first man was tempted by an evil spirit to disobey God; he yielded, and thus sin entered into the world, human nature fell into ungodliness; and all mankind, descending from the first man, have inherited a proneness to depart from God. This inherited evil manifests itself as sin in men as soon as the moral nature issues into action. Restoration for the individual or for the race is only through a new importation of the lost Divine life by the coming in human flesh of the eternal Son of God, who was manifested as 'the seed of the woman' that he might redeem man and 'destroy the works of the devil.' Humanity, which fell in the first Adam, rises again and far higher in the second Adam.

2. Other theologians consider the third chapter of Genesis in the main allegorical—representing a picture of the violence of appetite in our first parents. More definite as to the form of the narrative, they tend to be less definite as to the doctrine. In this view, the serpent is a mere imaginary accessory—the emblem of temptation; the supposed interview between God and our first parents is of the same character—the emblem of the voice of conscience following unlawful indulgence: the tree of the knowledge of good and evil represents some form of sensual indulgence. The

only realities in the picture are the moral realities, conscience and temptation in some carnal form—realities which were no more powerful in the case of our first parents than they are in the case of all their descendants who yield to unlawful indulgence, as they did. The doctrine of the Fall, according to this interpretation, is simply the doctrine of the abuse of free will in our first parents; and the question of the relation of this primary sin to all subsequent sin, is variously regarded by this class of theologians. All of them would repudiate any formal imputation of it; yet all or most allow some actual transmission or inheritance of corrupted will, as the consequence of the original abuse of it.

The Pelagian theory maintained, indeed, that the race was not the worse for Adam's fall; but that, as our first parents 'were to blame for yielding to a temptation which they might have resisted, so all of us, by a proper attention in cultivating our natural powers, may maintain our innocence amid the temptations with which we are surrounded: and, therefore, that we fall short of that which it is in our power to do, if we do not yield a more perfect obedience to the law of God than Adam yielded.' The Arminian theory, again contended that the chief loss of the race, as the consequence of the trangression of our first parents, was the subjection to death thereby incurred, and the moral disadvantages arising out of the fear of death. Others, more othodox than either, contend that the spiritual unity of the race necessarily implies that the depraved will of our first parents has descended to their posterity as their unhappy portion.

3. The opinion of those who look upon the chapter in Genesis as a mere myth or fable, representing a dream of the religious imagination, without any special moral meaning, cannot be said to come within the pale of Christian theology. The Doctrine of the Fall is with them only a devout idea, inconsistent with their principles of philosophy and history, and which, accordingly, they dismiss from their speculation or concern altogether.

FAL-LA, n. *făl-lâ'* [derived from *fal la*, with which each line or strain ended]: in *mus.*, a short song with the syllables *fal la* at the end of each line or strain. Morley about 1580), who composed some of them, speaks of their being a kind of ballet. Those of Hilton (about 1600) are held in the highest estimation for freedom of construction and beauty of melodies. Gustildi is the reputed inventor of *fal-las*.

FALLACIOUS, a. *făl-lā'shŭs* [L. *fallācĭōsus*, deceitful—from *fallo*, I deceive: F. *fallacieux*]: deceiving: deceptive; not well founded; producing error or mistake. FALLA'CIOUSLY, ad. *-lĭ*. FALLA'CIOUSNESS, n. FALLACY, n. *făl'lă-sĭ* [F. *fallace*, deception, a fallacy—from L. *fallācĭă*]: that which misleads the eye or the mind; deceptive appearance; a sophism.

FAL'LACY: incorrect reasoning. The science of Logic

(q.v.) reduces sound reasoning to certain rules, and when any of these rules is violated, the error is called a logical fallacy. The term is also applied loosely to any misunderstanding of a word, phrase, sentence or argument where language is used in such a way as naturally to cause confusion or conceal true meaning. The classic discussion of the subject is that of Aristotle. Francis Bacon's account of the 'idols' of thought is likewise notable.

Most writers accept the classification of fallacies into two main groups, *formal* and *material*. The first group consists of infractions of the rules for the form of the syllogism (q.v.). When a term is used in a wider sense in the conclusion than in the premises it is called an 'illicit' term (major or minor); e.g., 'most fever patients are thirsty; this sick man is not thirsty; so his illness is not fever.' Here the conclusion would be true only if *all* fever patients were thirsty, whereas the premise contains only 'most.' Equally common is the mistake called 'undistributed middle,' i.e., the partial and different usages of the middle term in the premises. Thus in the syllogism, 'My friends are polite to me; this man is polite to me; hence he must be my friend,' neither premise tells us anything about the *whole class* of polite persons, and so the failure to distinguish between '*friendly-polite*' and '*designing-polite*' suggests a possibly false conclusion. Another frequent blunder is that of '*imperfect disjunction*.' From the premise 'Hard times are due to bad laws or to poor crops' a conclusion may be drawn which does not take proper account of the fact that these causes may act together, and that there may be some other unmentioned cause.

The *material* fallacies are certain mistakes in meaning which may be indicated without reference to syllogistic form. *Ambiguity*, the use of a term in two senses, is notoriously common. Sometimes what is true of individual parts is wrongly supposed to hold true of the whole, as when it is said that a government is good because its members are good men. This is 'composition;' (q.v.), the converse fallacy is 'division.' Similar to these is the fallacy of 'accident,' which consists in arguing that what is true of a thing generally, is true of it under special conditions, e. g. 'Strychnine is a deadly poison, and therefore ought never to be used as a medicine.' An important error is the 'petitio principii' or 'begging the question.' It lies in assuming a premise which really contains the very conclusion to be drawn from it. Under this head comes 'circular reasoning,' e. g., 'It is wrong to keep slaves because slavery is immoral;' and the 'complex question,' which cannot safely be answered by either yes or no, like the pleasantry 'Have you given up your drinking habits?' 'Ignoratio elenchi' (literally, ignoring the thumbscrew') or 'irrelevant conclusion' embraces the various methods of distracting attention from the real issue, sometimes by abusing one's opponent ('argumentum ad hominem') or appealing to the pride, passion or prejudice of the audi-

ence, or invoking great names in support of a position, and sometimes by proving or disproving a conclusion which is so nearly like the one under discussion as to be confused with it.

The principal fallacies of inductive reasoning (see INDUCTION) are 'errors in observation,' 'hasty generalization,' i. e., the formulation of a general law without sufficient examination of individual cases, and 'false cause' or 'post hoc ergo propter hoc.' The last occurs when some unimportant antecedent of an event is taken as its cause. It is the source of manifold superstitions, such as that connected with the number thirteen; and appears also in popular traditions about weather, etc., as in the supposition that the rising moon dispels clouds.

FALLIBILITY, FALLIBLE: see under FALL.

FALLIERES, *făl'lā-rēs*, CLÉMENT ARMAND: French statesman: b. in Mézin, near Agen, France, 1843. He rose from humble origin, his grandfather having been a blacksmith and his father a county clerk. His early school days gave no promise of his future brilliant career; he was dull and backward in his classes; but, having subsequently studied law in Paris, he passed his examinations with credit. Returning to Agen, he began the practice of his profession in his native town, and soon attained a leading rank; was chosen mayor, and in 1876 was elected to the national Chamber of Deputies, where he served until 1890. Meanwhile he was twice Minister of Public Instruction and twice Minister of Justice, and in 1883 he became Premier. In 1890 he was elected to the Senate, and in 1899 became president of that body. In 1906, Jan. 17, he was elected President of the French Republic. He is a moderate republican in politics, and although a Catholic, he has favored the separation of church and state. Without unusual brilliancy, Fallieres is a man of strong mental powers and of the highest moral character.

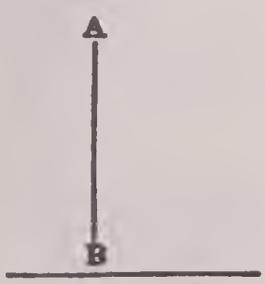
FALL'ING BOD'IES: substances descending toward the earth's centre. Owing to gravity (q.v.), all terrestrial bodies, if unsupported, *fall*, or move toward the earth's centre. The theory of the descent of bodies under gravity was discovered and first taught by Galileo (q.v.). When a falling body is absolutely without support, it is said to fall freely, as distinguished from one descending an inclined plane or curved surface.

1. *Bodies falling freely.*—The first fact of observation regarding falling bodies is that they fall with a variable velocity; from this we infer that they are acted upon by some force. Again on observing how the velocity varies, we find that its increments in equal times are equal; from this we conclude that gravity is a uniform force, which it is, at least sensibly, for small distances above the earth's surface. We have next to find a measure for this force. By experiment, it is found that a body in 1″ falls through 16.1 ft., and that at the end of 1″ it moves with such a velocity, that if it continued to move uniformly after the 1″ expired, it would

pass over 32·2 ft. in the next second. Hence 32·2 ft. is the measure of the velocity which has been generated in 1″, and is therefore the measure of the accelerating force 32·2 of gravity; for the measure of accelerating force is the velocity which it will produce in a body in a second of time. The quantity 32·2 ft. is usually denoted by the letter *g;* and it is to be noted that this quantity measures the accelerating force of the earth's attraction on all bodies. Experiment shows that under the exhausted receiver of an air-pump all bodies fall with equal rapidity, and that the difference of velocities of falling bodies in air is due entirely to the action of air on them.

As the accelerating force is uniform, it follows that the velocity generated in any time, t, will be given by the formula $v = gt$. Since the force is uniform, it must generate an equal velocity every second. In t'', therefore it must generate a velocity gt, since it produces g in 1″. In 2″, a falling body will be moving with a velocity of 64·4 ft.—i.e., were the velocity to become constant for the third second, it would in that second move through 64·4 feet.

We are now in a position to inquire more particularly how bodies fall, and to answer such questions as first: What time will a body falling freely take to fall through a given space? Second: What velocity will it gain in falling through a given space? Third: How high will a body ascend when projected straight up with a given velocity? etc. Let A be the point from which a body falls, and B its position at the end of the time *t;* and let AB = S. Then we know that at B the body has the velocity gt. Suppose, now, the body to be projected upward from B toward A with this velocity gt—gravity acting against it, and tending to retard its motion. We know that at the end of a time t it will be again at A, having exactly retraced its course, and lost all the velocity with which it started from B, because gravity will take just the same time to destroy the velocity gt which it took to produce it. From this consideration we may obtain an expression for the space AB or S in terms of the time t. In the time t, the body rising from B with a velocity $= gt$ would ascend, if not retarded, a height $(gt) \cdot t$, or gt^2. But in the time t, gravity, we know, carried it through S; it will therefore, in the same time, by retarding it, prevent it going to the height gt^2 by a space = S. The space through which it actually ascends is then represented by the difference gt^2—S; but this space we know to be AB or S. Therefore S = gt^2—S; or $2S = gt^2$, or $S = \frac{1}{2}gt^2$. We may give this equation another form. For v being the velocity acquired in the time t, $v = gt$, $\therefore t = \frac{v}{g}$. Then $S = \frac{1}{2}g \cdot \frac{v^2}{g^2} = \frac{v^2}{2g}$. Hence $v^2 = 2gS$. From these formulæ, we see that when a body falls from rest under the action of gravity, its velocity at



any time varies as the time, and the square of its velocity as the space described.

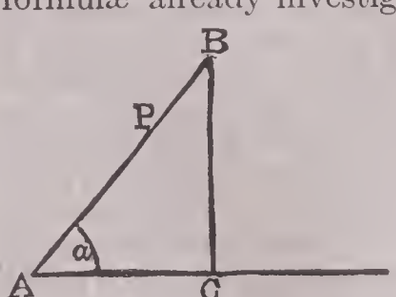
If the body instead of starting from rest has an initial velocity V; and if v, as before, be the velocity at the time t, then evidently v is = the original velocity + that which is generated by gravity, or $v = V + gt$; and the space will be that which would have been described by the body moving uniformly with a velocity V + that which it would describe under gravity alone, or $S = Vt + \frac{gt^2}{2}$. With regard to the last two formulæ, it is easy to see that they may be made to suit the case of a body projected upward with a velocity V, by a change of signs; thus, $v = V - ft$, and $S = Vt - \frac{gt^2}{2}$; gravity here acting to destroy velocity, and diminish the height attained. From the general formulæ in the case of an initial velocity, whether the body be projected upward or downward, we may express v in terms of S, as we did in the case of motion from rest. For

$$v^2 = (V \pm gt)^2 = V^2 \pm 2g\left(Vt + \frac{gt^2}{2}\right) = V^2 \pm 2gS.$$

These are all the formulæ applicable to the case of falling bodies, and by their means all problems in this branch of dynamics may be solved. It appears also that the formulæ above investigated apply to all cases of rectilinear motion of bodies considered as particles under the action of any uniform force. In all such cases, if f measure the accelerating force $S = \frac{1}{2}ft^2$, $v_2 = 2fS$, for the case of motion from rest; and $S = Vt \pm \frac{1}{2}ft^2$, and $v^2 = V^2 \pm 2fS$, for the case of an initial velocity.

Any one can easily frame for himself examples illustrative of the formulæ. We subjoin one: A stone falls down a well, and in 2″ the sound of its striking the bottom is heard. How deep is the well? Neglecting the time occupied in the transmission of sound, the formula $S = \frac{1}{2}gt^2$ applies, or S = depth $= \frac{1}{2}g \cdot 2^2$, t being 2″; ∴ depth $= 2g$, or 64·4 feet.

2. *Bodies descending inclined planes.*—In this case the formulæ already investigated apply with a slight change.



In the figure, if P be a body on the inclined plane AB, descending under gravity, we observe that only that resolved part of gravity parallel to AB is effective to make it descend, the other part at right angles to AB merely producing pressure on the plane. The angle of inclination of the plane being a, we know (see Composition and Resolution of Forces) that the resolved part of gravity parallel to the plane is $g \sin, a$. The body, then, may be conceived to be descending under a uniform accelerating force

g sin. a. We obtain the formulæ, accordingly, for descent on inclined planes by substituting g sin. a for f in the general formulæ given above. We notice, however, that in descent on inclined planes the velocity acquired is, as in the case of bodies falling freely, due solely to the vertical height through which the body falls. By our formula, $v^2 = 2g$ sin. a . S, where S = AB, if the body falls from B. This may be written $v^2 = 2g$. S . sin. a, or $= 2g$. AB . sin. a, or $= 2g$. BC, since AB . sin. a = BC. But this is the same as the velocity acquired by a body in falling freely through BC. In fact, it holds generally true, that the velocity acquired by a body falling down the surface of any smooth curve is that due to the vertical height through which it has fallen; which might be proved in various ways, but is sufficiently clear from this, that any curve may be considered as a succession of inclined planes, indefinitely short in length and great in number; for the proposition being true, as above proved, for each of them, will be true for all, and therefore for the curve.

For an account of the variations of the value of g, due to the earth not being a perfect sphere, and other causes, see EARTH: see also ATWOOD'S MACHINE.

FALLMERAYER, *fâl'mĕh-rī-ĕr*, JACOB PHILIPI: 1791, Dec. 10—1862; b. Tschotsch, near Brixen in the Tyrol: German traveller and historian. He studied at Brixen, and 1809 went to Salzburg, where he gave instruction in history and Latin. At the Univ. of Landshut, he studied law, history, and philology. When Germany rose against Napoleon 1813, he entered the Bavarian army, and took part in several engagements. After peace Fallmerayer returned to his studies. In 1826, he was appointed to the chair of history and philology at Landshut. In 1831, he accompanied the Russian gen., Count Ostermann-Tolstoy, in a journey to the East, visiting Egypt, Palestine, Syria, Cyprus, Rhodes, Greece, Turkey, and Italy. During 1830-40, he resided with Count Ostermann-Tolstoy at Geneva, and in the next eight years twice revisited the East. The events of 1848 recalled him to Bavaria, and for a short time he sat as a deputy to the Frankfurt parliament, but after 1850 he lived privately in Munich. Fallmerayer was a distinguished polyglot, and spoke a great number of European and Oriental tongues. His principal works, are *Geschichte des Kaiserthums Trapezunt* (Münch. 1831), *Geschichte der Halbinsel Morea im Mittelalter* (2 vols. Stuttg. 1830-36), and *Fragmente aus dem Orient* (2 vols. Stuttg. 1845). His views on the origin of the modern Greek language have excited the liveliest controversy in Greece and elsewhere. A complete ed. of Fallmerayer's works appeared at Leipsic 1861, entitled *Gesammelte Werke von Jakob Philipp Fallmerayer*.

FALLOPIAN, a. *făl-lō'pĭ-ăn* [from *Fallōpĭŭs*, reputed discoverer]: in *anat.*, denoting certain ducts or tubes through which the ova pass to the uterus.—The Fallopian Tubes, or oviducts, are named after Fallopius, usually

regarded as their discoverer. They are canals four or five inches in length in the human subject, opening at their inner extremity into the upper angle of the uterus or womb, and at the other end, by a fringed funnel-shaped termination, into the cavity of the peritoneum. This fringed or fimbriated extremity at certain periods grasps the ovary, and receives the ovum, which is discharged by the rupture of the Graafian vesicle: see OVARIES. The ovum usually passes along one of the Fallopian tubes into the uterus, where it is either impregnated by contact with one or more spermatozoa, or is absorbed. Sometimes, however, the ovum becomes not only impregnated, but retained and developed, in the Fallopian tubes, thus giving rise to one of the forms of extrauterine pregnancy.

FALLOPIUS, *făl-lō′pĭ-ŭs*, GABRIEL: celebrated anatomist; b. at or near Modena, about 1523 (quite uncertain); d. 1562. According to the above date he was only 25 years old when promoted from the Univ. of Ferrara to a professorship at Pisa, whence, after a few years, he was called to Padua, to succeed Vesalius, who had been compelled by the Inquisition to resign his office: see VESALIUS. Cuvier characterizes Fallopius as one of the three *savants* who restored rather than created the science of anatomy in the 17th c., the two others being Vesalius and Eustachius. After his short but brilliant career was ended by death, he was succeeded by his favorite pupil, Fabricius ab Acquapendente (q.v.).

He published numerous works in various departments of medicine, of which the most important is *Observationes Anatomicæ, in libros quinque digestæ*, 1561, in which he corrected many errors into which his predecessor, Vesalius, had fallen. He was the first to describe with accuracy the ethmoid and sphenoid bones, and the minute structure of the ear (the canal along which the facial nerve passes, after leaving the auditory, is still known as the aqueduct of Fallopius); the muscles of the soft palate, and the villi and valvulæ conniventes of the small intestines. In some of his supposed discoveries, he had been long anticipated; for example, the tubes passing from the ovary on either side to the uterus, which bear his name, were known to, and accurately described by, Herophilus and Rufus of Ephesus, 300 years B.C. In addition to his anatomical fame, he had a reputation as a botanist: he was supt. of the botanical garden at Padua; and a genus of plants, *Fallopia*, has been named after him. A complete ed. of his works, four folio vols., was published 1600.

FALLOUX, *fâl-lô′*, FRÉDERIC ALFRED PIERRE, Comte DE: French author and statesman: b. Angers, 1811, May 11; d. there 1886, Jan. 7. His family was distinguished for its legitimist zeal, and at the Restoration was rewarded by letters of nobility. Young Falloux first drew attention by two works showing ardent love of the old Bourbon order of things—*L'Histoire de Louis XVI.* (Paris 1840), and *L'Histoire de Saint Pie V., Pape, de l'Ordre des Frères*

prêcheurs (Paris 1844). These indicate the level of his political and religious faith. In the elections of 1846, he was chosen deputy for the dept. Maine-et-Loire. In religion, he advocated the ideas of Montalembert; in politics, those of Berryer, but united with his legitimist sentiments a love of liberty and education strangely incongruous with the historic character of his party. After the revolution of 1848, Feb., he showed much energy as a member of the constituent assembly, was one of those who organized the resistance to the insurrection of May 15, and, as reporter on the national workshops, pronounced for their immediate dissolution. He was also one of the most ardent promoters of the expedition to Rome. After the election of Louis Napoleon to the presidency, Falloux was appointed minister of public instruction, an office which he held only ten months. After the events of 1851, Dec. 2, he retired from public life to a country seat near Angers, where he occupied himself with agriculture. In 1857 he was admitted a member of the French Acad., and published at Tours his *Souvenirs de Charité.* He published, 1859, *Mme. Swetchine, sa Vie et ses Œuvres;* 1863, *Méditations et Prières;* 1864, *La Convention du* 15 *Septembre;* 1865, *Itinérarie de Turin à Rome;* 1866, *Lettres inédites de Mme. Swetchine.*

FALLOW, a. *făl'lō* [F. *fauve;* OF. *falve,* a deep yellow —from Ger. *falb,* pale: AS. *fealo,* pale-reddish, or yellowish]: applied to a species of deer (see below): in *OE.,* pale-brown, with a tinge of red or yellow.

FALLOW, a. *făl'lō* [AS. *fealo,* yellowish: Icel. *fölr,* pale: Dut. *vaal,* fallow, faded: Scot. *fail,* a sod or turf: Sw. *vall,* sward: prov. Dan. *fælde,* to give a first shallow plowing: comp. Gael. *falamh,* empty]: applied to land that has lain a year or more untilled; denoting land plowed but not seeded for the season; neglected: V. to plow up land without seeding it. FAL'LOWING, imp.: N. the operation of plowing land not meant to be sown. FAL'LOWED, pp. *-lōd,* plowed and opened up to the air for the season. FAL'LOWNESS, n. exemption from bearing fruit. TO LIE FALLOW, to lie uncropped; to rest; to remain unexercised. —*Fallow* signifies sometimes waste, untilled land; but usually plowed and otherwise stirred for a season without being cropped. The most of the wheat raised by the Romans was sown after the land was fallowed; indeed, the usual rotation was fallow and wheat alternately. It was only fertile soils that could long support such an exhausting system; hence resulted the decreasing produce which the later Roman agricultural authors so often lament.—The fallowing of land was introduced into all the countries which fell under the dominion of the Romans. During their sway in Britain, that country soon exported large quantities of wheat; and for centuries after the Romans left it, no other mode of cultivating the land was followed. Wherever the system of fallowing, without giving manure to the crops, is practiced, it necessarily sup-

poses that the soil is at least moderately fertile. This system is most successful on argillaceous soils, retentive of organic manure. It must be borne in mind that the chief use of fallow is to liberate the plant-food already stored in the soil as organic matter. The plowing and stirring, by admitting air, promote decomposition, in the same manner as the turning over of a dunghill does; they also destroy the roots of the weeds that impoverish and choke the crops. In the most retentive clay-soils, fallowing affords the only means of thoroughly cleaning the land. Where there is a rotation of beans, clover, oats, fallow, wheat, and barley, each field is subjected to a process of fallowing once in every six, seven, or eight years. Fallow-fields usually receive a deep furrow in autumn. Lying exposed through the winter, the frost pulverizes the surface. In spring, when the weather becomes dry, the cultivator or the plow opens up the soil, and the process of extirpating the weeds goes on. Sometimes as many as three or four furrows are given in summer before the seed is sown in autumn. In old cultivated countries, land is commonly so much reduced in its organic matter, that fallows receive dressings of farm-yard manure, rape-dust, or guano, to obtain fertility. Since the general introduction of green crops, the term fallow has departed in some measure from its original meaning. These crops are sown on what was formerly the fallow-break, and are now often styled fallow-crops. The land, no doubt, receives in some measure a fallowing, as the green crops are cultivated by the plow during their growth. Bastard-fallowing is a term used in Scotland when hay-stubble land is plowed in the end of summer, freed from weeds, and sown with wheat in autumn.

FAL'LOW CHAT: see WHEATEAR.

FAL'LOW DEER (*Dama vulgaris* or *Cervus Dama*): species of deer commonly kept in *parks*, in most parts of Europe. It is probably a native of the countries around the Mediterranean, and has been introduced by man into the more northern parts of Europe, where it is now in some places found wild in forests. It is doubted whether it has not been introduced by man, at a remote period, from n. Africa even into the south of Europe. How far its geographic range extends eastward, is not certainly known. It is represented in the sculptures of Nineveh. Its introduction into Britain is ascribed to James VI. of Scotland, who is said to have brought it from Norway when he brought home his queen, Anne of Denmark, and after his accession to the English throne, to have transported it to Enfield and Epping. Thousands of fallow deer are now in some of the English parks. They generally receive some attention and supplies of fodder in winter.

In size, the fallow deer is smaller than the stag or red deer, from which it differs also in its broad palmated antlers, longer tail, and smoother and finer hair. In color, it is generally yellowish brown in summer; darker, or even blackish brown in winter; more or less spotted with pale

spots, particularly in summer and when young; but in one variety the spots are very marked; in another they are not to be observed even in the young. The buttocks are white, and a dark line passes along the back. White fallow deer are sometimes seen. The female has no horns. The male is called a Buck (Fr. *daim*), the female a Doe (Fr. *daime*), the young a Fawn (Fr. *faon*). The name fallow deer is derived from its color. When the fallow deer and red deer are kept in the same park, the herds seldom mingle, nor do hybrids occur. The fallow deer loves the woods. The flesh of the fallow deer is one of the most esteemed kind of venison. The remains of fossil species nearly allied to the fallow deer occur in some parts of Europe. The great fossil Irish *Elk* (q.v.) is allied to it.

FALLOWS, Samuel, American Reformed Episcopal bishop: b. Pendleton, Lancashire, England, 1835, Dec. 13. He came to America in 1848; was graduated at the University of Wisconsin in 1859; was minister in the Methodist Episcopal church 1859-75, and later of the Reformed Episcopal church. He served with distinction in the Civil war; was state superintendent of public instruction in Wisconsin 1871-4; regent of the University of Wisconsin in 1866-74; and president of Wesleyan University in 1874-5. He became rector of St. Paul's Reformed Episcopal church in Chicago in 1875, and bishop in 1876. He is author of numerous works, including: *Handbook of Abbreviations and Contractions; Life of Samuel Adams; Students' Biblical Dictionary; Past Noon; Splendid Deeds; Supplemental Dictionary of the English Language; Bright and Happy Homes; The Home Beyond; Synonyms and Antonyms; Handbook of Briticisms, Americanisms, etc.; The Bible Looking Glass; Story of the American Flag* (1903); *Science of Health* (1904); *Christian Philosophy* (1905); *Memory Culture* (1905); etc.

FALL RIVER, Mass., city, port of entry, in Bristol county; on Mount Hope Bay at the mouth of the Taunton river; on the New York, N. H. & H. railroad; 49 miles south of Boston. It is connected with New York by the Fall River line of steamers, with Philadelphia by the Windsor freight line, and with New England seaports by passenger and freight lines of steamers. The area of the city is 41 square miles, and it is 200 feet above the sea-level. It has a good harbor, sufficiently commodious for the largest steamers, and excellent water power, as the Fall River, the outlet of Watuppa Lake, has a fall of 129 feet in less than half a mile. The water for city uses comes from Lake Watuppa, and the waterworks plant is owned by the municipality. The streets are well laid out; many of the buildings are constructed of the granite which is found in the vicinity. It has excellent public and parish schools, notably the B. M. C. Durfee public high school and the Academy La Ste. Union des Sacrés Cœurs; good circulating libraries, a State armory, over half a hundred churches and chapels, daily and weekly newspapers,

and electric street railway connections with neighboring cities and towns.

Fall River is the largest cotton-milling city in the United States. According to the Federal census of 1900 the city had 785 manufacturing establishments, employing $58,549,934 capital, and 32,780 persons; paying $11,739,129 for wages, and $19,789,859 for materials; and having a combined output valued at $43,071,530. The cotton industry, 42 establishments, with $45,641,084 capital, and a combined output valued at $29,097,667. Next in value of output was the dyeing and finishing of textiles ($2,995,979). Other important manufactures were foundry and machine shop products ($932,873); bakery products ($555,267). There are 7 national banks with more than $2,000,000 capital and $1,500,000 surplus and several savings and co-operative banks. The exchanges at the United States clearing-house during the year ending 1905, Sept. 30, aggregated $35,270,629.

The city was originally a part of Freetown, but was incorporated separately in 1803. Later it was called Troy, but its first name was restored in 1834. The city charter was granted in 1854, and in 1862 Fall River in Newport County, R. I., was annexed. Pop. (1910) 119,295.

FALLS CITY, Neb., city, county-seat of Richardson County; on the Burlington & M., and the M. P. R.R.'s; about 85 miles southeast of Lincoln. Its chief manufactures are flour, canned goods, cigars, foundry products, furniture, and beer. The trade is chiefly in wheat, corn, cattle, and manufactured articles. The electric light and waterworks plants are owned by the city. It has a good public library. Pop. 3,050.

FALMOUTH, *făl'mŭth:* parliamentary and municipal borough and seaport in the s.w. of Cornwall, on a w. branch of the estuary of the Fal. 14 m. n.n.e. of Lizard Point, 269 m. w.s.w. of London. It consists chiefly of a narrow street, a mile long, on the s.w. of the harbor, and of beautiful suburban terraces and villas on the heights behind. The harbor, one of the best in England, is formed by the estuary of the Fal. 5 by 1 to 2 m. in extent, 12 to 18 fathoms deep, and affording shelter to 500 vessels at a time. The mouth is defended on the w. by Pendennis Castle, on a rock 198 ft. high, and which resisted a siege by Cromwell for six months; on the e. by Mawes Castle—both built by Henry VIII. F. arose in the middle of the 17th c., Sir Walter Raleigh having at an earlier period drawn public notice to its capabilities; and it has since been a rendezvous for fleets and mail-packets proceeding abroad.—Pop. (1901) 11,789.

FALMOUTH: a town in Barnstable co., Mass.; on Vineyard Sound, Buzzards Bay, and on the New York, New Haven, and Hartford railroad, at the extreme w. end of Cape Cod; 50 m. n. w. of Boston. It is the center of a cranberry and agricultural region, but is best known as containing the Wood's Holl Station of the U. S. Fish Commission. Pop. (1910) 3,144.

FALSE, a. *fawls* [OF. *fals*—from L. *falsus*, deceived: Ger. *falsch;* Icel. *falskr*, false: comp. Gael. *fallsa* false, deceitful]: not true; not real or genuine; inaccurate; counterfeit; deceitful; treacherous: V. in *OE.*, to violate truth; to deceive; to feign. FALS'ING, imp. FALSED, pp. *fâlst*, deceived; falsified. FALSE'LY, ad. *-lĭ*. FALSE'NESS, n. state of being false; double-dealing; treachery. FALSE-ATTIC, n. *-ăt'ĭk*, in *arch.*, attic without pilasters, casements, or balustrades, used for crowning a building, and bearing a bas-relief or inscription. FALSE-BARK, n. in *bot.*, layer on the outside of the stem of an oxygen, which consists of cellular tissue with fibrous tissue entering it obliquely. FALSE-BEDDING, n. in *geol.*, cross bedding in which the minor layers are not parallel to the principal ones. Prof. Sedgwick says three distinct forms of structure are exhibited in certain rocks throughout large districts: Stratification, Joints, and Slaty Cleavage. The first of these constitutes true bedding; the others may be classed together as false-bedding. Joints are natural fissures which often traverse rocks in straight and well-determined lines. Slaty cleavage, which is best seen in the clay slate and other metamorphic rocks, generally crosses the true planes of stratification at a high angle. The rock can be cleft into fissile layers parallel to the cleavage. FALSE-BLOWS, n. in *bot.*, the staminate flowers of the melon and cucumber; because they produce no fruit. FALSE-BROME-GRASS, a name applied to *Brachypodium*, a genus of grasses consisting of about a dozen species, natives of temperate countries. Glumes very short and empty. FALSE-CORE, n. in *foundries*, a part of a pattern which is used in the undercut part of a mold, and is not withdrawn with the main part of the pattern, but removed by a lateral draft subsequently. FALSE-FIFTH, n. in *mus.*, a fifth altered from its perfect or major state. FALSE-FIRE, n. in *naut.*, a blue flame, made by the burning of certain combustibles in a wooden tube, and used as a signal in the night, and for deceiving the enemy; called also blue flame. FALSE-HEARTED, a. treacherous. FALSE'HOOD, n. a lie; an untruth (see FRAUD). FALSE-KEEL, n. *naut.*, a keel, usually of elm, and composed of several pieces. It is fitted under the main keel, to preserve it from friction, and to make the ship hold a better wind. FALSE-NERVED, n. in *bot.*, applied to veins which have no vascular tissue, but are formed of simple elongated cellular tissue, as is the case in mosses, sea-weeds, etc. FALSE-PARSLEY, n. in *bot.*, *Æthusa Cynapium*. FALSE-RAIL, n. in *naut.*, thin piece of timber attached inside of a curved head-rail, in order to strengthen it; a facing or strengthening rail faced to a main rail. FALSE-RELATION, n. in *mus.*, the occurrence of chromatic contradiction in different parts or voices, either simultaneously or in chords so near together that the effect of one has not passed before the other comes to contradict it with a new accidental. FALSE-ROOF, n. in *arch.*, open space between the ceiling of an upper apartment, and the rafters of the outer roof; a garret. FALSE-WORKS, n. in *civil eng.*, construction works for the erection of the main works.

Coffer-dams, bridge-centring, scaffolding, etc., are false-works. FALSIFY, v. *fawl′sĭ-fī* [L. *făcĭō*, I make]: to make something appear true which is really false; to prove to be false; to forge; to violate the truth. FAL′SIFYING, imp. FAL′SIFIED, pp. *-fīd*. FAL′SIFIER, n. one who. FAL′SIFICA′TION, n. *-fĭ-kā′shŭn*, quality of being false; the act of making a thing appear what it is not. FAL′SITY, n. *-sĭ-tĭ*, an untruth from ignorance or mistake. FAL′SER, n. in *OE.*, a false or deceitful person.—SYN. of 'falsehood': falsity; fabrication; fiction; treachery; perfidy.

FALSE, RULE OF, or FALSE POSITION: mode of reckoning in cases where a direct solution of the question is impracticable. Any number is chosen at hazard, as that which is sought; this *false position* of course gives a false result, and from the amount of the error, it is ascertained by proportion what the assumption ought to have been. *Ex.* What number is that whose half exceeds its third by 12. Assume 96 at random; 48—32 gives 16, which is too great; ∴ 16: 12: : 96 : 72, the number required. This method is now mostly superseded by the use of equations.

FALSE AND PRETEND′ED PROPHE′CIES, with intent to disturb the public peace: punishable as crime under the common law in England by several old statutes, unrepealed, but no longer enforced.

FALSE BAY: inlet which may be referred either to the Atlantic, the Southern, or the Indian Ocean. It washes the e. side of the mountainous district of S. Africa, which terminates in the Cape of Good Hope, and extends e. along the coast as far as False Cape; about 22 m. in length, and about the same in breadth. F. B. is sheltered from the n.w. monsoon, to which Table Bay—the harbor of Cape Town—is supposed: this advantage is especially possessed by Simon's Bay, at its n.w. extremity. Hence, besides periodically receiving trading-vessels from Cape Town for temporary protection, it is a permanent naval station.

FALSE CADENCE: a musical term. When the last chord of a phrase is other than the tonic chord, and is preceded by that of the dominant, the cadence is said to be interrupted, false or deceptive. See CADENCE.

FALSE CHINCH-BUG: a wheat insect pest. It is a small blackish plant-bug (*Blissus cucopterus*), with white wing-covers each marked with a dark line like a figure 6. Arising from her winter sleep the female lays several hundred eggs on the stems and roots of the sprouting grasses and grains near her. The young hatch quickly, and in a crowd of reddish dots suck out the juices of the growing plants. There is another brood in the fall. Severe winters and wet and cold springs reduce the numbers of this pest, and certain diseases are known which spread among the bugs and destroy them. Infected bugs have been sent from diseased districts to other regions and imparted to the bugs there with good effect. There seems to be no preventive, however, except great care in burning stubble and rubbish, keeping the fields clean, and late planting.

FALSE IMPRIS'ONMENT: confinement or detention by another, without cause, or without legal cause. Every confinement of the person is an imprisonment, whether it be in a common prison or a private house, or in the stocks, or even by forcibly detaining one in the public streets (Coke, *Inst.* ii. 482). Thus, where a man gives another in charge for committing an offense, the former is liable to an action for false imprisonment, if he fails to substantiate his case. Police-officers, also, are liable for apprehending a man without a competent warrant, or without reasonable suspicion. But where a felony has been committed, an officer is entitled to arrest on suspicion. Not only constables but private persons may arrest a man who commits a felony in their presence. A person who has falsely imprisoned another is liable to a criminal prosecution, and also to a civil action. Any one detained without sufficient cause is entitled to apply for a writ of *Habeas Corpus* (q.v.) to procure his liberation. In Scotland, this species of offense is called Wrongous Imprisonment.

FALSE NEWS or RU'MORS: a crime under the common law of England. Spreading false news to make a discord between the sovereign and nobility, is a misdemeanor. The law before the Conquest had been more severe, and required that the author and spreader of false rumors should have his tongue cut out, if he redeemed it not by estimation of his head (or capitation tax). One of the articles against Cardinal Wolsey was founded on this principle of common law. 'Also the said cardinal has busied and endeavored himself by crafty and untrue tales against your nobles of your realm.'—Coke, *Inst.* iv. 92. The feeling of the present day is more in accordance with the axiom of Tacitus, *Convicia, si irasceris, tua divulgas, spreta excolescunt* (if you seek to revenge slanders, you publish them as your own; if you dispise them, they vanish).

FALSE PRETENSES, OBTAINING MONEY BY: one of various kinds of fraud. Under the English common law, mere fraud not amounting to felony, was not indictable unless it affected the public. Examples of fraud indictable at common law were—the use of false weights and measures; the sale of goods with counterfeit marks; playing with false dice; and frauds affecting the course of justice. Offenses like the first three named, known technically as 'cheats' derived their significance from the fact that they were perpetrated by means of false tokens or symbols. The use of such tokens brought them within the principle that the injury, to be indictable had to be of a public character. While many statutes prohibiting particular kinds of cheating in specified trades had been enacted from early times, the necessities of commerce made it apparent that unless the boundaries of the law respecting the offense generally were enlarged, many cases of grievous fraud would go unpunished. This extension of the law, so as to embrace the numerous varieties of verbal frauds, though gradually accomplished, proceeded very slowly. The first generally statute on the subject in Eng

land, namely, 33 Hen. VIII. chapter 1, enacted by the parliament of 1541–42, made frauds accomplished by means of false tokens and counterfeit letters practiced on individuals, misdemeanors. This statute is usually regarded as simply declaratory of the common law existing at the time. The statute did not apply to any *verbal* misrepresentations by means of which many frauds might be accomplished. The statute of 30 George II. chapter 24, was therefore passed by the parliament of 1757. This law directed 'that all persons who knowingly and designedly by false pretense or pretenses shall obtain from any person or persons money, goods, wares, or merchandises with intent to cheat or defraud any person or persons of the same, shall be deemed offenders against law and the public peace, and the court before whom such offenders shall be tried, shall on conviction, order them to be fined and imprisoned, or to be put in the pillory, or publicly whipped, or to be transported for seven years as the court shall think fit.' But new kinds of property, namely securities and choses in action, then slowly assuming a definite legal status under English law, were found unprotected by this and the preceding statute. A statute, 52 George III., chapter 64, was therefore passed in 1812 to extend the law, to embrace bonds, bills of exchange, bank notes, all securities and orders for the payment of money, or the transfer of goods, or any valuable thing whatsoever. In 1827, on account of the subtle distinctions between larceny and fraud, under the law then existing, it was found necessary to pass another act, viz., 7 and 8 George IV., chapter 29, section 52, re-defining the offense, and providing that there should be no acquittal, notwithstanding that the case actually proved against one on trial for obtaining property under false pretenses, amounted to the technical offense of larceny. Finally the entire English law on the subject was codified by the statute 24 and 25 Victoria, chapter 96, sections 88 and 89, enacted in 1861, which provides for, and punishes every species of obtaining money or property by false pretenses.

In the United States, statutes, following the English, and based principally on 30 George II., chapter 24, heretofore noticed, have been generally enacted in the individual states. The effect of the American statutes has been to embrace the numerous varieties of obtaining money or property by false pretenses, not covered by the common law. It may be stated as a general proposition, under these American statutes, that it is indictable to obtain money or goods from individuals by *any* designedly false statements of facts likely, under the particular circumstances of the case, to deceive (Wharton, Crim. Law). Among others, the following false pretenses, followed by actually obtaining money or goods, have been held indictable in American law—that the party was a person of wealth and credit; that he was the owner of specific assets; that he had funds in the hands of a third party; pretending to have supernatural powers; to have delivered goods or to have been sent therefor; false personation of other persons; fictitious legal claims. False pretenses must however, be distin-

guished from mere 'puffing' or an exaggerated praise. The latter is not indictable unless specific assertions, actually false, are knowingly made. Obtaining property by giving checks which are known to the party to be worthless is a criminal false pretense, and this also applies to spurious money. It is not necessary, that a party, to make himself criminally liable, shall make use of false words. The false pretense may be implied from his conduct, or even from his silence when acquiescing in another's statements. The false pretense is not required to come from the indicted personally; he may be crimnally responsible, though the act were performed by an agent or confederate. It is, however, a fundamental rule, that the articles must have been obtained by means of the false pretense, though the latter is not required to be the sole motive for giving them up. To constitute the offense the *property* in the articles must be parted with by the party defrauded. If merely the *possession* be surrendered, the crime is not complete, though in such case a person may be guilty of larceny, if having obtained possession he subsequently takes the property.

FALSE RETURN', ACTION FOR: remedy against a false return made by a sheriff to a writ. When a sheriff makes a false return to a writ, the party injured may maintain an action against him for damages. Thus, a return of *non est inventus* to a writ of *capias*, when the defendant might have been apprehended, or a return of *nulla bona* to a *fieri facias*, when there were goods which might have been seized, renders the sheriff liable in damages to the amount of loss occasioned by his negligence.

FALSE SIG'NALS: any false light or signal exhibited with intent to bring any ship or vessel into danger. The act is made felony, and the felonious intent may be proved by declarations made by the accused, or by circumstances which fairly lead to the conclusion of a guilty purpose.

FALSE SWEAR'ING: see PERJURY.

FALSETTO, n. *făwl-sĕt'tō*, also FALSET [It.]: in *singing*, a strain on the voice above its natural compass; a feigned or false voice. The term is applied to the highest register of a man's voice, which joins the natural or chest voice, and which by practice may be so blended with the chest-voice as to make no perceivable break.

FALSE VER'DICT: verdict by a jury against the evidence. The remedy in cases where it was alleged that a false verdict had been returned, was formerly in England by means of a writ of attaint; but this only in cases where the jury had returned a verdict on their own knowledge of the facts, and the writ proceeded on the assumption that, in returning a false verdict, they were necessarily perjured. Writ of attaint was abolished under George IV.—The universal rule now is, that though in most civil cases a new trial may be had for various causes, in no case can jurymen be punished, though finding a verdict against evidence.

FALSE WEIGHTS AND MEA'SURES: frandulent devices in trade, whose use is an offense at common law.

FALSI CRIMEN, phrase, *făl'sī krī'mĕn* [L. the crime or charge of what is false or fraudulent]: in *law*, fraudulent ornation or concealment, allied to forgery.

FALSIFY, FALSIFICATION, etc.: see under FALSE.

FAL'SIFYING REC'ORDS: obliterating, injuring, or destroying any record, writ, etc., or any original documenet belonging to any court of justice. It is a serious crime severely punishable, as is the crime also of any person employed to furnish certified copies wilfully certifying any document as a true copy, knowing the same is not so similar is the crime of any person employed in a public record office certifying any writing to be a true copy, knowing the same to be false in any material part.

FALSTER, *fâl'stėr:* Danish island in the Baltic, s. of Seeland, lat. 54° 30′—54° 58′ n., and long. 11° 45′—12° 11′ e. It is separated by the strait called the Grönsund from the island of Moen, and by that called the Guldborgsund from the island of Laaland, together with which Falster forms the stift or province of Laaland, a province with 635 sq. m., and about 200,000 inhabitants. Falster is about 26 m. long, and 16 wide at its widest part, and has about 178 sq. m. It is flat, remarkably fruitful, and well cultivated, so that it resembles an attractive garden. The inhabitants are employed chiefly in agriculture and cattle-breeding. The chief town is Nykjöbing, on the Guldborgsund. It is very old, has a castle and a cathedral, has some commerce and shipbuilding, and a pop. about 4,000. The only other place of any note is Stubbekjöbing.—Pop. of the island of Falster, (1901) 34,436.

FALTER, v. *fawl'tėr* [OF. *falter*, to fail: Norw. *haltra*, to limp: Sp. *faltar*, to fail, to falter—connected with FAULT: comp. Gael. *fealltair*, a perfidious person]: to hesitate in speaking; to speak with broken or trembling tones; to be unsteady or feeble; to hesitate in purpose. FAL'TERING, imp.: ADJ. hesitating. FAL'TERED, pp. *-tėrd.* FAL'TERINGLY, ad. *-tėr-ĭng-lĭ.*

FALTER, v. *fawl'tėr* [Gael. *falt*, the hair of the head]: in *OE.*, to thrash barley in the chaff; to cleanse barley. FALTERED, pp. *fawl'tėrd*, having hair disordered; dishevelled.

FALUNS, *fâ'lŭnz:* term given by the agriculturists of Touraine to shelly sand and marl, which they use as manure. The term is applied by geologists to the formations from which they are obtained. They are loosely aggregated beds of sand and marl, but occasionally so compacted by calcareous cement as to form a soft building-stone. The animal remains in them are chiefly marine, and of a more tropical fauna than that of the Mediterranean. A few land and fluviatile mollusca are found mixed with the oceanic forms, and with these are associated the remains of terrestrial quadrupeds, as Dinotherium (q.v.), Mastodon (q.v.), Rhinoceros (q.v.), etc.

FALX, n. *fălks* [L. a sickle, a scythe]: in *anat.*, anything shaped like a sickle or scythe.

FAMA, *fā′ma* [Gr. *Pheme*]: in *classical myth.*, the goddess of rumor. She appears in the works of the earliest poets. Sophocles makes her the child of Hope; Virgil, the youngest daughter of Terra, the sister of Enceladus and Cœus.

FAMA CLAMOSA, *fā′ma kla-mō′sa*, in the Ecclesiastical Law of Scotland: wide-spread report, imputing immoral conduct to a clergyman, probationer, or elder of the church. A fama clamosa, if very clamant, may form the ground of process by a presbytery, without any specific complaint being brought before them, or there being any particular accuser. In these circumstances, the presbytery act for the vindication of their own order, and in behalf of the morals of the community. Should the inquiries of the presbytery lead them to the conviction that the rumor is not without foundation, they will serve the accused party with a libel, and thus bring him for trial before them. (Hill's *Church Prac.* 49; Cook's *Styles;* and Wood *On Libels.*)

FAMAGOSTA, *fâ-mâ-gŏs′tâ*, or FAMAGUSTA, *fâ-mâ-gôs′tâ:* seaport on the e. coast of Cyprus (q.v.); on the supposed site of ancient Arsinoë, about 35 m. from Lefkosia (q.v.), present cap. of the island. It was a place of importance in the crusades, and under the Venetians 1489—1571 it became rich and flourishing, with a pop. of fully 30,000 inhabitants; now only a few hundreds find shelter among the filthy ruins, the wreck of its churches and palaces. On coming under the sway of the Turks after a siege of four months, it fell into a state of decay; an earthquake 1735 completed its ruin. The town is inclosed within well-built walls, constructed from the ruins of Salamis; but of its 300 churches, only one, that of St. Nicolas, remains. It is now used as a mosque, but contains many monuments of its former use, and is a fine specimen of mediæval architecture; in it Richard I. of England crowned Guy de Lusignan king of Cyprus, 1191. Famagosta possesses a good natural harbor, about 8,000 ft. long, by 2,000 ft. wide, which would require to be dredged before it could admit ships of the largest tonnage. The water in the bay exceeds 170 fathoms in depth. Under Turkish rule Famagosta was simply regarded as merely a military fortress and occupied by the sultan's troops; since Cyprus became a British possession, the affairs of the town and province have been administered by a resident civil commissioner and his assistant, with numerous native officials. About five m. n. are the ruins of ancient Salamis. Chief exports of Famagosta are corn and pomegranates, for which the district is famous. Pop. 3,400.

FAME, n. *fām* [F. *fame*—from L. *fāma*, rumor, fame: Gr. *phēmē;* It. *fama*, rumor, fame: comp. Gael. *fuaim*, sound, noise]: renown; rumor; public report, good or bad. FAMED, a. *fāmd*, renowned; much talked of. FAMOUS, a. *fā′mŭs*, much talked of and praised; renowned. FA′MOUSLY, ad. *-lĭ*, with great renown; in a manner highly gratifying, as, he is getting on *famously.* FA′MOUSNESS,

n. great fame; celebrity.—Syn. of 'fame': reputation; repute; notoriety; credit; honor;—of 'famous': celebrated; remarkable; noted; signal; conspicuous; illustrious; eminent; transcendent; distinguished; excellent.

FAMILIAR, a. *fă-mĭl'yėr* [F. *famille,* a family—from L. *famĭlĭă,* a family or household: It. *famiglia:* comp. Skr. *dhámman,* an abode, a house]: well acquainted with; well known; intimate; affable; easy and unconstrained; common; frequent: N. one long acquainted; a spirit or demon supposed to wait on; an officer or servant of the Inquisition (q.v.) employed to arrest and imprison the accused. Famil'iarly, ad. *-lĭ.* Famil'iar'ity, n. *ĭ-ăr'ĭ-tĭ* [F. *familiarite'*]: freedom from ceremony; affability; intimacy; fellowship. Famil'iarize, v. *-yėr-īz,* to make intimate or familiar; to make easy by practice or by intercourse. Famil'iarı'zing, imp. Famil'iarized, pp. *-īzd.* Family, n. *făm'ĭ-lĭ,* a household; descendants from one common progenitor; race; lineage; in *nat. hist. classifications,* the group next in comprehensiveness above a *genus* (see Order, in Natural History): kind, tribe, or group. Family of Love: see Agapemone.

FAMIL'IAR SPIR'ITS: supernatural beings, spirit slaves, deemed to be in attendance upon magicians, wizards, witches, conjurors, and other skilful professors of the black art. The word 'familiar' is in all likelihood derived from the Latin *famulus* (a 'domestic,' a 'slave'). The belief in such spirits goes far back into the history of the race. We read of them in the time of Moses, who admonishes his countrymen.—'Turn ye not unto them that have familiar spirits' (Lev. xix. 31), which would imply the prevalence of the belief among the Jews and Egyptians. The word in the original rendered 'familiar spirits' is *oboth;* it is of frequent occurrence in the Hebrew Scriptures, and literally signifies 'leathern bottles'; thereby indicating the antiquity of the idea, that magicians were wont to imprison in bottles the spirits whom their spells had subdued (whence our 'bottle-imps' and 'bottle-conjurors'); cognate with which grotesque belief is perhaps the fact that mystical liquids kept in vials have been immensely in vogue among conjurors of all ages and countries. It is not clear, as some think, that we can include Socrates among those who deemed themselves to have a familiar spirit; for though he spoke of his attendant 'dæmon' in ambiguous terms, the opinion of all enlightened critics is, that he meant by the word that which Christians mean by the presence of a divine light and guide in the heart and conscience. But according to Delrio—a great authority on this subject—the belief in familiar spirits in the grosser and more magical form did exist among the ancient Greeks; who, he affirms, designated such beings *Paredrii,* 'companions,' as being ever assiduously at hand. The story of the ring of Gyges, king of Lydia, narrated by Herodotus, is held by Heywood (see *Hierarchie of the Blessed Angels,* etc.) to prove the existence of the belief in that country

also; and it is quite certain that during the middle ages the belief in 'enchanted rings' containing familiar spirits was widely diffused throughout Europe, the magicians of Salamanca, of Toledo, and of Italy, being especially famous for their skill in thus subjugating and imprisoning demons. Asia seems the original home of this belief, which has long been established as a cardinal superstition of the Persians and Hindus, and which appears in perfection in the *Arabian Nights*. The 'slave of the lamp' who waits upon Aladdin is an example in point. Whether the belief in spirit slaves sprang up independently among the nations of w. Europe, or was transplanted thither by intercourse with the East, is not known. A favorite form assumed by the familiar spirit was that of a black dog. Jovius and others relate, that the famous Cornelius Agrippa (q.v.), half philosopher, half quack, was always accompanied by 'a devil in the shape of a black dog'; and add, that when he perceived the approach of death, he took a collar ornamented with nails, disposed in magical inscriptions, from the neck of this animal, and dismissed him with these memorable words: *Abi, perdita Bestia, quæ me totum perdidisti*—('Away, accursed beast, who has ruined me wholly for ever'). In spite of the servitude to which the attendant imps were reduced by the potent spells of the magicians, they were popularly supposed, during the middle ages, to have their revenge at last, by carrying with them into eternal torment the souls of their deceased masters. This idea of divine retribution overtaking the practicers of magic is, however, not found outside of Christendom. The Jews think not the less but the more of Solomon because he was, as they say, one of the greatest of magicians; and a similar feeling in regard to 'wonder-workers' pervades eastern nations generally, though it is to be noticed that the latter are often represented as using their power malignantly: see MAGIC. Modern spiritism in some of its phases shows the tenacity of this belief in the human mind, without which it could have no basis for its amazing structures of fraud: see SPIRITISM.

FAMILIST, n. *făm'ĭ-lĭst* [L. *familia;* Eng. *-ĭst*]: in *chh. hist.*, a sect which arose in Holland about the middle of the sixteenth c., and taught that the essence of religion consisted in the feelings of divine love, hence they were otherwise called the Family of Love, though entirely distinct from the Agapemone (q.v.). Some familists were fanatical perfectionists; others were grossly immoral.

FAM'ILY: household; having at least its usual nucleus, though not usually its limits, in a common lineage. Though we are in the habit, doubtless with reason, of regarding the life of antiquity, and particularly of Greece, as less domestic than that of Christian Europe, the idea of the family or house [Gr. *oikós*], as the nucleus of society, as the political unit, was there very early developed. Aristotle speaks of it as the foundation of the state, and quotes Hesiod to the effect that the original family con-

sisted of the wife and the laboring ox, which held, as he says, to the poor the position of the slave (*Polit.* i. 1). The complete Greek family then consisted of the man and his wife and his slave; the two latter, Aristotle says, never having been confounded in the same class by the Greeks, as by the barbarians (*Ib.*). In this form, the family was recognized as the model of the monarchy, the earliest, as well as simplest, form of government. When, by the birth and growth of children, and the death of the father, the original family is broken up into several, the heads of which stand to each other in a co-ordinate rather than a strictly subordinate position, we have in these the prototypes of the more advanced forms of government. Each brother by becoming the head of a separate family, becomes a member of an aristocracy, or the embodiment of a portion of the sovereign power.

But at Rome the idea of the family was still more closely entwined with that of life in the state, and the natural power of the father was taken as the basis not only of the whole political, but of the whole social organization of the people. For the Roman idea of the family in its more special aspects: see PATRIA POTESTAS. Here it suffices to state that with the Romans, as with the Greeks, it included the slave as well as the wife, and ultimately the children; a fact which indeed is indicated by the etymology of the word, which belongs to the same root as *famulus*, a slave. In its widest sense, the *familia* included even the inanimate possessions of the citizen, who, as the head of a house, was his own master (*sui juris*); and Gaius (ii. 102) uses it as synonymous with *patrimonium*. In general, however, it was confined to persons—the wife, children, grandchildren, and great-grandchildren, if such there were, and slaves of a full-blown Roman citizen. Sometimes, too, it signified all those who had sprang from a common stock, and would have been members of the family, and under the potestas of a common ancestor, had he been alive: see AGNATE. In this sense, of course, the slaves belonging to the different members of the family were not included in it. It was a family, in short, in the sense in which we speak of 'the royal family,' etc., with this difference, that it was possible for an individual to quit it, and to pass into another by adoption: see ADOPTION.

The whole social fabric is based on the grouping of human beings in families; an arrangement in harmony with all the conditions and wants of human life, and which tends to foster habits and affections essential to the welfare of mankind. A prosperous community must be an aggregate of happy families; there being little true happiness in the world that is not intimately connected with domestic life. The formal bond of the family is marriage (q.v.; see also POLYGAMY); and an essential condition of its right development seems to be a distinct abode, which shall be not a mere shelter, but a house or *home*, affording a certain measure of comfort and decency, according to the standard prevalent in the community.

FAMINE, n. *făm'ĭn* [F. *famine*—from mid. L. *famĭnă*—from L. *fămēs*, hunger: It. *fame;* F. *faim*, hunger: comp. Gael. *feum*, to be in want]: scarcity of food; want; destitution. FAM'ISH, v. *-ĭsh*, to starve; to suffer from want. FAM'ISHING, imp.: ADJ. starving; perishing for want of food. FAM'ISHED, pp. *-ĭsht*. FAM'ISHMENT, n. state of extreme want. FAMINE-FEVER, n. in *med.*, typhus fever; relapsing fever.

FAMINE: in general a period of suffering produced by scarcity of food. Famines have occurred in all parts of the world and from remote ages. Extended lists have been made of the most distressing ones with more or less particularity of detail, and scientists have presented thoughtful speculations upon their causes. Among the avoidable causes are enumerated war, defective agriculture, deficient transportation, legislative interference, currency restrictions, speculation in food products, and misapplication of grain; and among natural causes are excessive rain, frost, drought, earthquakes, hurricanes, hail-storms, and plagues of vermin, insects, worms, rats, and rabbits. How many human beings perished in the famines of which some records have been preserved cannot be computed, but the number must have extended into hundreds of millions, since it is known that those in India alone have carried off more than 30,000,000 within little more than a century. The increase of railroads and other means of intercommunication has not lessened the occurrence of famines to the extent anticipated, though it has had the effect of immeasurably ameliorating the suffering in stricken localities by hastening the means of relief. As far back as B.C. 1708 Egypt was visited by a 7 years' F., during which millions of people and animals perished. In B.C. 436 thousands of people threw themselves into the Tiber at Rome to escape terrors of starvation, and other thousands starved outright. Egypt again suffered A.D. 42, and Rome 262, when the horrors of a plague were added to the affliction of a F. In 272 Great Britain was visited by such a severe F., that the people were forced to eat the bark of trees; in 306 both F. and plague spread over Scotland, carrying off thousands; 4 years later, England lost 40,000 people from the same causes; and in 325 all of Great Britain suffered from a F. Phrygia experienced its terrors 370, Constantinople 446, and Italy, where parents were reduced to the awful extremity of eating their own children, 450. Scotland had another visitation 576, and the British isles then had a respite till 739, when England, Wales, and Scotland were plunged into a common distress, which was repeated 823 and 954–9, while England was an isolated sufferer 974, 976, 1005. Since 1000, India has suffered most from F., and Great Britain next. It will be interesting to note the years of the most severe visitations in the former country, as they cover much of the period of modern administration, refute the old claim that the opening of railroads and post roads would decrease the occurrence of F., and show that these ameliorating agencies are powerless against the natural causes already enumerated. In 1771 Bengal was devastated; 1837

-8 over 800,000 perished in the N. W. Provinces; 1860–1 the same region suffered nearly as severely; 1865–6 about 1,000,000 died in Bengal and Orissa; 1868–9 about 1,500,000 in Rajpootana and vicinity; 1874 a F. occasioned by drought carried off thousands more in Bengal; 1877 about 500,000 died in Bombay, Madras, Mysore, and adjoining agencies, and the govt. determined to lay aside $7,500,000 annually for provision against future famines, the same to be known as the F. insurance fund and to be used in construction of protective works such as railroads and canals, 1880. Subequent to 1005 England suffered in the general F. that scourged nearly the whole of Europe 1016, and in 1087, 1193–95 (when a pestilential fever accompanied it); 1251, 1315 (when the people were forced to eat even the most loathsome animals), 1335 (caused by long rain), 1353, 1748 (through the whole realm), 1795 and 1801 (also through the realm). Ireland suffered independently, chiefly in consequence of the failure of the potato crop, 1814, 16, 22, 31, 46, 47, and 80. At the last period the U. S. govt. sent a war vessel thither with food, of which James Gordon Bennett, Levi P. Morton, and William R. Grace contributed each a fourth part of the entire cargo. France shared with England the distress of 1193–95, 1353, and was isolated 1693, 1789. The n. provinces of China were devastated 1876–79; Brazil had its first serious F. 1878; Egypt was visited 1879; Persia lost many thousands 1871–72, 1880; Cape Verde, Africa, lost 16,000, 1775; Iceland had a F. caused by the unusually severe polar winter, 1881–2, which rendered agriculture impossible in most parts, and the distress of the people was aggravated by epidemics of small-pox and measles; the w. Highlands of Scotland, the Hebrides Islands, and the coast of Ross-shire suffered extreme destitution from the entire failure of the potato crop and herring-fishery and the destruction of the grain crops by hurricanes 1882; Upper Silesia experienced its greatest destitution from an overflow of the Oder river 1880; suffering from scarcity of food and freezing of winter wheat prevailed in many parts of European Turkey and especially in Armenia through 1880, and led to wide-spread rioting; and a severe drought produced a F. in Anatolia and the vilayets of Broussa, Angora, Konieh, Adana, Smyrna, and Sevas, Asia Minor, in the summer of 1887.

In 1891-2 a F. affected 27,000,000 people in 18 provinces of Russia; 1900, 30,000,000 suffered and more than 1,000,000 died in the central and southern portions of India. 1902-3 a large portion of the population of Finland suffered; and 1903, June, it was officially reported that over 1,000,000 natives in Kwang Si province, China, were starving. In all of these cases the citizens of the United States contributed liberally to aid the sufferers.

FAMOUS: see under FAME. FAMOUSED, a. *fā'mŭs-ĕd*, less correctly *fā'mŭst*, in *OE.*, rendered famous; renowned.

FAMULUS, n. *făm'ū-lŭs* [L. *famŭlŭs*, a servant, an attendant]: the familiar spirit of a magician; any doer of hard or dirty work under a superior.

FAN, n. *făn* [Ger. *wanne;* L. *vannus*, a winnowing fan: Gael. *fannan*, a gentle breeze]: a light broad covered frame used to cool the face by agitating the air with it; anything in the shape of a fan; an instrument for producing artificial currents of air by the revolving of two or more broad blades, used for winnowing grain (see FANNERS): V. to cool and refresh by moving the air; to winnow, as grain; to increase the heat or flame of, as by fanners. FAN'NING, imp. FANNED, pp. *fănd*. FAN'NERS, n. plu. the blowers of a winnowing machine or furnace (see below). FAN-CORAL, n. in *zool.*, name of the genus *Rhipidogorgia*, belonging to the family *Gorgonidæ*. FAN-CRICKET: see MOLE-CRICKET. FAN-FOOT, n. in *entom.*, a name given to the genus of moths *Polypogon,* in *zool.*, *Ptyodactylus Gecko*, species of lizard, a native of northern Africa, reputed to be exceedingly venomous. The toes form at the extremities round disks (whence the name *Fanfoot*), enabling the animal to climb up walls; the claws are retractile. The venom is said not to be injected by the teeth, but to be exuded from the lobules of the toes, whence the scientific name Ptyodactylus, from Gr. *ptuo*, to split, and *daktulos*, a finger or toe. FAN-LIGHT, a fan-shaped window, usually over a door. FAN-TRACERY, *-trā'sėr-ĭ*, carved work in Gothic architecture diverging like the folds of a fan. FAN-TAIL, tail of a bird capable of being spread out like a fan; a kind of pigeon. FAN-TAIL WARBLER, n. in *ornith.*, *Cisticola cursitans*, a very tiny bird, somewhat like a diminutive lark; native of southern Europe, Africa, India, and China. It is remarkable for its neat and beautiful nest.

FAN: instrument for moving the air for the sake of coolness, or for winnowing chaff from grain. In the East the use of fans for personal comfort is of remote antiquity. The Hebrews, Egyptians, Chinese, and the miscellaneous population of India, all used fans as far back as history reaches. At the present day, it is customary, in the better classes of houses in India, to suspend a large fan from the ceiling, and keep it in agitation with strings, pulled by servants, in order to give a degree of coolness to the air: see PUNKAH. Among the oldest notices of winnowing fans are those in the Scriptures. There the fan is always spoken of as an instrument for driving away chaff or for cleansing in a metaphorical sense; and such notices remind us of the simple processes of husbandry employed by a people little advanced in the arts. It was a long stride from the use of a simple hand-instrument for winnowing to that of the modern mechanism employed for a similar purpose: see FANNERS: BLOWING MACHINES.

As is observable from the collection of Egyptian antiquities in the British Museum, the fan is a very ancient article of female taste and luxury. Terence, writer of Latin comedies, B.C. 2d c., makes one of his characters speak of the fan as used by ladies in ancient Rome: *Cape hoc flabellum, et ventulum huic facito*—'Take this fan, and give her thus a little air.' From this Roman origin, the fashion of carrying fans could scarcely fail to be handed

down to the ladies of Italy, Spain, and France, whence it was in advanced times brought into Great Britain. Queen Elizabeth, when in full dress, carried a fan. Shakspeare speaks of fans as connected with a lady's 'bravery' or finery:

> With scarfs and fans, and double charge of bravery.

In these and later times the fan was not a mere article of finery. There were walking as well as dress fans. The walking or outdoor fan which a lady carried with her to church, or to public promenades, was of large dimensions, sufficient to screen the face from the sun, and answered the purpose of the modern parasol (q.v.). In old prints, ladies are seen carrying these fans in different attitudes. The dress fan, which formed part of a lady's equipment at court ceremonies, drums, routs, and theatrical entertainments, was of a size considerably less than the walking fan, and altogether more elegant. Of these dress fans there remain numerous specimens bequeathed as heirlooms from one generation to another. All were probably of French manufacture. The more costly fan imported from China was and still is altogether of ivory, higly carved and pierced; but it lacks the lightness and flexibility essential in this article, which was used less for cooling than for giving the hands something to do, and for symbolically expressing certain passing feelings. In the hand of an adept, the fan, by peculiar movements, could be made to express love, disdain, modesty, hope, anger, and other emotions. Gay, speaking of Flavia's accomplishments, says:

> In other hands, the fan would prove
> An engine of small force in love.

Considering the coarseness of language, even in the higher circles, in the early part of the 18th c., we cannot wonder that the fan should have been indispensable to a lady in company. It was held up to shield the countenance when anything shocking was uttered. Pope has an allusion to this use of the fan—

> The modest fan was lifted up no more,
> And virgins smiled at what they blushed before.

Steele in a paper in the *Tatler*, No. 52, 1709, Aug. 9, gives an amusing account of Delamira, a fine lady, resigning her fan when she was about to be married. One of her female acquaintances, having envied the manner in which this charming and fortunate coquette had played her fan, asks her for it. Delamira acknowledges the wonderful virtues of the fan, and tells her that 'all she had above the rest of her sex and contemporary beauties was wholly owing to a fan (that was left her by her mother, and had been long in the family), which, whoever had in possession, and used with skill, should command the hearts of all her beholders; "and since," said she smiling, "I have no more to do with extending my conquests or triumphs, I will make you a present of this inestimable rarity."' Two years later, Addison, in a paper in the *Spectator* (No. 102), gives a humorous accout of the tactics of coquettes in the use of fans, 'Women are armed with fans as men with swords,

and sometimes do more execution with them;' then he goes on to describe how ladies are instructed to handle, discharge, ground, and flutter their fans—the whole being a pleasant satire on the fan-maneuvering in the reign of Queen Anne.

Later, in the 18th c., fans served another important purpose. At dancing assemblies in London, Bath, and elsewhere, it was usual for the gentlemen to select their partners by drawing a fan. All the ladies' fans being placed promiscuously in a hat, each gentleman drew one, and the lady to whom it belonged was his allotted partner. Mrs. Montagu, in one of her letters, refers to this custom: 'In the afternoon, I went to Lord Oxford's ball at Mary-le-bone. It was very agreeable. The partners were chosen by their fans, but with a little *supercherie.*' Of the trick or fraud which this authoress delicately veils under a French term, the beaux of that period were far from guiltless. A lady's fan was almost as well known as her face, and it was not difficult, with a little connivance, to know which to draw. At Edinburgh, where it appears to have been the practice to select a partner for a whole season, the fans of the ladies were carefully studied. Sir Alexander Boswell alludes to this species of stratagem in one of his poems:

> Each lady's fan a chosen Damon bore,
> With care selected many a day before;
> For unprovided with a favorite beau,
> The nymph, chagrined, the ball must needs forego.

In Spain, the old fashion of fan-flirting appears to be still in vogue. A traveller in that country says: 'I was vastly interested in the movements of the ladies' fans at church. All the world knows that Spanish fans are in perpetual motion, and betray each feeling, real or assumed, that passes through the mind of the bearer."—*Vacation Tourists,* 1861. See *The Fan* by Uzanne (transl. 1883).

FANAL, n. *fa-nâl'* [F.—from Gr. *phanos,* lamp—from *phainō,* I show, I shine forth]: a light-house; or, more correctly speaking; the apparatus in the light-house for giving light.

FANAM, n. *făn'ăm:* money of account formerly used in Madras; value about 3½ cents; copper coin of Ceylon worth about 3 cents.

FANARIOTS, *fan-âr'ĭ-ots:* general name given to the Greeks inhabiting the Fanar or Fanal in Constantinople, a quarter of the city which takes its name from the beacon (Gr. *phanarion*) in it. They first appear in history after the taking of Constantinople by the Turks, and appear to have been originally descendants of such noble Byzantine families as escaped the fury of the barbarians. Afterward, however, the class was recruited by emigrants from different parts of the old Byzantine empire. Subtle, insinuating, intriguing, they soon took advantage of the ignorance of the Turkish governors, and made themselves politically indispensable to their rulers. They filled the offices of dragomans, secretaries, bankers, etc. One of them, named Panayotaki, at a later period, was appointed Dragoman to

the Divan, and his successors obtained still greater honors. Through their influence, the lucrative office of Dragoman of the Fleet was called into existence, which gave them almost unlimited power in the islands of the Archipelago. Besides, from them were chosen, until the outbreak of the revolution 1822, the Hospodars of Wallachia and Moldavia, while, in addition, the disposal of most of the civil and military posts under the Turkish govt. was in their hands. In spite of their power, however, the Fanariots never showed much patriotism; they were animated by the petty motives of a caste, and when the war of liberation broke out among their countrymen, they took no part in it. In the present altered state of affairs in Turkey, they have no political influence. See Marco Zalloni's *Essai sur les Fanariots* (Marseille, 1824; 2d ed. 1830); also Finlay's *History of the Greek Revolution* (Edin., Blackwood and Sons 1861).

FANATIC, a. *fă-năt'ĭk*, or FANAT'ICAL, a. *-ĭ-kăl* [F. *fanatique*, fanatic—from L. *fanatĭcus*, inspired by a divinity, frantic—from *fānŭm*, a temple: It. *fanatico*]: extravagant and excessive in opinions, generally religious opinions: N. a person possessed of wild notions or opinions; an enthusiast. FANAT'ICALLY, ad. *-lĭ*. FANAT'ICISM, n. *sĭzm*, wild and extravagant notions on religious subjects.—SYN. of 'fanatic, n.': visionary; zealot; bigot;—of 'fanaticism': enthusiasm; frenzy; superstition.

FANCY, n. *făn'sĭ* [F. *fantasie*, the fancy—from mid. L. *fantāsĭă*—from Gr. *phantasĭă*, a making visible, imagination—from *phaino*, I appear]: an image or representation formed in the mind at pleasure, but not always connected with reason or practicability; a notion; a liking; a conceit or whim (see IMAGINATION): ADJ. elegant; ornamental: V. to figure to one's self; to imagine; to like; to be pleased with. FAN'CYING, imp. FAN'CIED, pp. *-sĭd:* ADJ. imagined; imaginary; liked. FAN'CIER, n. *-sĭ-ẽr*, one who fancies or has a strong liking for, as a *dog-fancier*. FAN'CIFUL a. *-fûl*, guided by the imagination rather than by reason or experience; full of wild images; visionary; whimsical. FAN'CIFULLY, ad. *-lĭ*. FAN'CIFULNESS, n. THE FANCY [a slang term]: the whole body of sporting characters, usually applied to the prize-ring. FANCY-BALL, one at which fancy dresses, in various characters, are worn. FANCY-FREE, free from the power of love. FANCY-MONGER [see MONGER]: in *OE.*, one given to wild conceits and whims through love. FANCY-SICK, one with an unsound or distempered mind.—SYN. of 'fancy, n.': conceit; imagination; humor; taste; inclination; conception; caprice; impression; —of 'fanciful': ideal; capricious; imaginative; fantastic; wild; chimerical.

FANDANGO, n. *făn-dăn'gō* [Sp.]: like the *Bolero*, an old Spanish national dance, in 3-4 time. It is danced most gracefully in the country districts, usually to the accompaniment of a guitar, while the dancers beat time with castanets, a custom borrowed from the Moors. It proceeds gradually from a slow and uniform to the liveliest motion;

and notwithstanding the simplicity of the *pas*, vividly expresses all the graduations of the passion of love, in a manner sometimes bordering on licentiousness. The people are so passionately fond of it, that the efforts of the clergy have never been able to suppress it.

FANE, *fān* [L. *fānum*, a temple—from *fārī*, to speak, to utter in prophecy]: a church; a temple.

FANE, n. *fān* [Icel. *fáni*, a flag: Gael. *fannan*, a gentle breeze: L. *vannus;* Ger. *wanne*, a winnowing-fan: Ger. *wannen*, to winnow; *fahne*, a vane]: in *old* and *prov. Eng.*, anything on an elevation free to be moved by the wind like a flag, to show which way the wind blew; a weathercock—formerly made in various shapes, but seldom in that of a cock; in *OE.*, a banner. *Note.*—VANE is the word now used for FANE.

FANEUIL HALL, *făn′ėl*, popularly, *fŭn′ėl:* spacious public hall in Boston, erected 1742 by Peter Faneuil, and presented by him to the town. Peter Faneuil (1700-43) was of French-Huguenot descent; b. New York, and removed to Boston, where he amassed wealth in mercantile life. In its original condition, the building when completed and presented, contained a hall for public meetings, with smaller apartments above, and a basement used as a market. In 1761, it was destroyed by fire, and rebuilt. During the revolutionary struggle with England, the hall was so often used for important political meetings, that it became known as 'the cradle of American liberty.' In 1805, the building was increased in height by an additional story, and also increased in width. It is now about 80 ft. square. The hall contains some fine paintings; and the basement is no longer used as a market.

FANFARE, n. *făn′fâr* [F. *fanfare*, the sound of a trumpet; Gael. *fonn-fair*, the music of awakening, the reveille—from *fonn*, music, a tune; *fair*, the break of day]: a flourish of trumpets; short and lively military air or call, executed on brass instruments. It was brought by the Arabs into Spain, whence it passed into Mexico and the new world. FANFARON, n. *făn′fă-rŏn* [F.]: a bully, a swaggerer; a boaster who 'blows his own trumpet.' FANFAR′ONADE, n. *-nād*, blustering talk; swaggering; empty noise.

FANG, n. *făng* [AS. *fang*, a taking, a grasp: Ger. *fan gen*, to catch: Dut. *vangen;* Goth. *fahan*, to catch]: a pointed tooth; a tusk; a claw or talon; in *OE.*, a sheriff's officer: V. in *OE.*, to seize with fangs; to clutch. FANGED, a. *făngd*, having fangs. FANG′LESS, a. having no fangs. INTO HIS FANGS, into his clutches or power. TAKEN WITH THE FANG, in *Scottish law*, a thief apprehended with the stolen goods on his person. It is not very long since this word formed part of the common speech of Scotland:

> 'Snap went the shears, then in a wink,
> The *fang* was stowed behind a bink.'
> *Morison's Poems*, p. 110.

In England, also, the verb *fang* was still in use in Shakes-

peare's time: 'Destruction *fang* mankind' (*Timon of Athens*, iv. 3); and 'Master Fang,' in *Henry IV.*, is named after his office.

FANGLED, a. *făng'gld* [AS. *ficol*, fickle: Ger. *ficken*, to move lightly to and fro: comp. Gael. *faoinealach*, silly, foolish]: begun; newly made. FANGLE, n. *făng'gl*, a trifle; a vain thing; a newly-fashioned trifle. NEW-FAN'GLED, a. inconstant; changeable; given to novelty.

FANION, n. *făn'yŭn* [F.]: a small flag carried with the baggage of an army.

FANK, n. *fănk* [Scot.]: a sheep-cote or pen; a coil of rope: V. to put a sheep in a fold; to coil a rope. FANK'ING, imp. FANKED, pp. *fănkt.*

FAN'NERS [see FAN]: machine with blowers employed to winnow grain. In passing through the machine, the grain is rapidly agitated in a sieve, and falling through a strong current of wind, created by a rotatory fan, the chaff is blown out at one end, and the cleansed particles fall out at an orifice beneath. See BLOWING-MACHINE. The apparatus is chiefly of wood, and is moved by hand, or connected with the driving power of a thrashing mill or other engine. The fanners superseded the old and slow process of winnowing, which consisted in throwing up the grain by means of sieves or shovels while a current of wind, blowing across the thrashing floor, carried away the chaff. When the first machine was introduced into Britain, by a farmer in Scotland 1737, it met strong opposition, as interfering with the Divine prerogative which alone had power over the winds. But the advantages soon overcame the prejudice whose record Walter Scott has preserved in *Old Mortality*—making Mause Headrigg speak anachronously to her mistress about 'a newfangled machine for *dighting* the corn frae the chaff, thus impiously thwarting the will o' Divine Providence, by raising wind for your leddyship's use by human art, instead of soliciting it by prayer, or patiently waiting for whatever dispensation of wind Providence was pleased to send upon the shieling-hill.

FANNING, *făn'ĭng*, DAVID: 1756-1825; b. Wake co., N. C.: tory marauder. He was a carpenter by trade, and espoused the British cause in the latter part of the revolutionary war, in revenge for having been robbed by men calling themselves whigs. He organized a band of desperadoes in Chatham and Randolph counties, hung a number of whigs, desolated their settlements, captured the town of Pittsborough while a court was in session and carried off all the judges, lawyers, and spectators, raided Hillsborough the capital and captured Gov. Burke and his entire staff, and took the American Col. Alston and a guard of 30 men from his own house. He was commissioned a col. of militia by the British; fled to Fla., and then to St. John, N. B. after the war; became a member of the provincial assembly, was sentenced to be hanged for fresh crimes, 1800, and escaped to Digby, N. S., where he lived quietly till death.

FANO, *fā'nō* [Lat. *Fanum Fortunæ*, named from the temple of Fortune which the Romans erected here in commemoration of the defeat of Asdrubal on the Metaurus]: town and seaport of Italy, province of Urbino e Pesaro, finely situated in a beautiful and fertile district on the shore of the Adriatic, 30 m. n.w. of Ancona, near the mouth of the Metaurus. It is well built surrounded with walls and ditches, has a cathedral dedicated to St. Fortunato, and numerous churches containing many valuable paintings, among which are several of the best works of Domenichino, and an excellent 'Annunciation' by Guido. The remains of a triumphal arch of white marble, raised in honor of Augustus, are perhaps the chief object of classical interest. There is considerable trade in corn and oil, and in silk goods. Here, 1514, Pope Julius II. established the first printing-press with Arabic letters known in Europe. The port of F. was formerly well known to the traders of the Adriatic; its commerce, however, has declined, and the harbor is partly choked with sand.—Pop. 9,500.

FAN PALM: name common to all palms which have fan-shaped leaves, as the species of *Mauritia*, *Lodoicea* (Double Cocoa Nut), *Hyphæne* (Doum Palm), *Corypha*, *Livistona*, *Chamærops*, etc. The only truly European palm, *Chamærops humilis* (q.v.), is a F. P., as is also the N. American Palmetto. The Talipot Palm (*Corypha umbraculifera*) is called sometimes the Great Fan Palm. The Palmyra Palm is another fan palm. The fan-shaped leaf is produced by an abbreviation of the midrib of a pinnated leaf.

FANS, The: race of aborigines in Equatorial Africa, between the Gaboon and the Ogobai rivers, accurately, described first by Du Chaillu. They are a fine capable race of savages, but are habitual cannibals.—The *Fantis* are a race of Negroes (q.v.) on the Gold Coast.

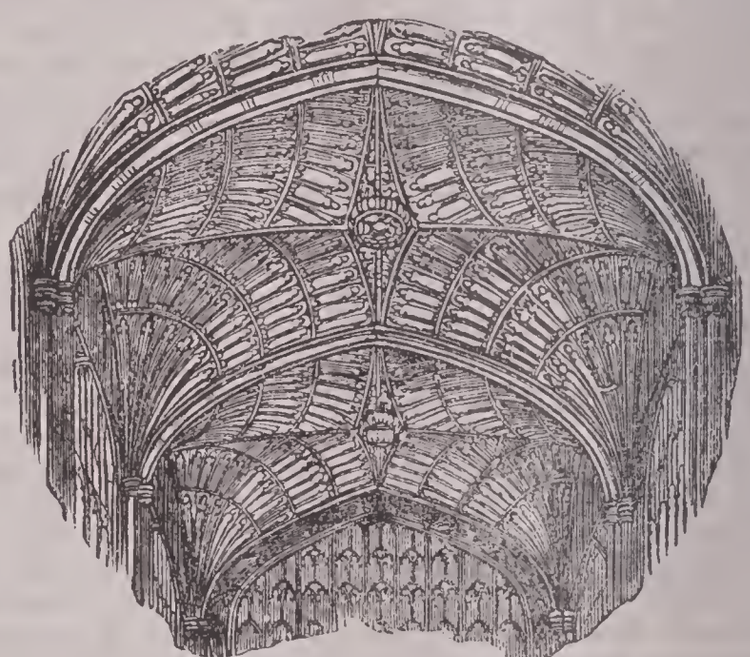
FANSHAWE, *făn'shaw*, Sir Richard: 1608–66: author and royalist partisan. He studied at Cambridge; and 1626, became a member of the Inner Temple. On the outbreak of the civil war, he took part with the king; and 1648, became treasurer to the navy under Prince Rupert. He was taken prisoner at the battle of Worcester; and on his release, withdrew to Breda in Holland, where Charles II. was holding his court in exile. After the Restoration, he was appointed ambassador at the court of Madrid, where he died. His most celebrated work, now very rare, is a translation of Guarini's *Pastor Fidor*, the lyrical passages of which are rendered with remarkable skill and elegance. The volume in which it appeared, 1664, contains other pieces in prose and verse.

FANTASIA, n. *făn-tâ'zhĭ-ă* [It.]: in *music*, a composition similar to the capriccio. The name is given also to extempore effusions performed by a musician with the rare gift of producing off-hand music like a well-studied composition. Hummel was more celebrated for his extempore fantasias on the pianoforte than even for his published compositions. Frederick Schneider was equally great in free fantasias on the organ.

FANTASTIC, a. *făn-tăs'tĭk*, or FANTAS'TICAL, a. *-tĭ-kăl* [F. *fantasque* and *fantastique*, fantastic—from mid. L. *fantăstĭcŭs*, capricious, disorderly—from Gr. *phantasiă*, vision, fancy (see FANCY)]: imaginary; fanciful; unreal; full of absurd fancies; capricious. FANTAS'TICALLY, ad. *-lĭ*. FAN'TASY, n. *-tă-sĭ*, the original spelling of FANCY, which see.—SYN. of 'fanastic': see under FANCY.

FANTOCCI'NI: see PUPPET.

FAN-TRACERY VAULTING: in *architecture*, a kind of Late Gothic vaulting (15th c.), so called from its resemblance to a fan. The ribs or veins spring from one point, the cap of the shaft, and radiate with the same curvature, and at equal intervals, round the surface of a curved cone or polygon, till they reach the semicircular or polygonal ribs which divide the roof horizontally at the ridge level. The spaces between the ribs are filled with foils and cusps, resembling the tracery of a Gothic window; hence the name *fan-tracery*. The spaces between the outlines of the fans at the ridge level, are called by Prof. Whewell (*German Churches*) ridge lozenges. In Henry VII.'s Chapel, Westminster, one of the best examples of this kind



Fan-tracery:
From King's College Chapel, Cambridge.

of vaulting, these lozenges are occupied by pendants, which produce a most astonishing effect, seeming to be arches resting on nothing. They are, however, supported with greath ingenuity by internal arches, rising high above the visible vaulting. This peculiar feature is one of the *tours-de-force* which astonish the common crowd, but are adopted only when art has degenerated into artifice. Fan-tracery is a very beautiful kind of vaulting, and is peculiar to England, where it originated, and where alone it was practiced. Among the finest examples besides Henry VII.'s Chapel at Westminster, are St. George's, Windsor; and King's College Chapel, Cambridge. Fan-tracery is

frequently used also in the vaulting of cloisters, as at Canterbury, Chester, etc.

FAR, a. *fâr* [AS. *feor;* Goth. *fairra,* far: Icel. *fjarri;* Sw. *fjerran,* afar]: distant; remote; more distant; remoter of the two: AD. remotely; very much; in a great part, as 'the night is *far spent.*' FAR'NESS, n. remoteness. FAR-FAMED, widely celebrated. FAR-FETCHED, strained; forced; unnatural. BY FAR, very much. FAR OTHER, very different. Far OFF, at a great distance. FAR ABOUT, going much out of the way. FROM FAR, from a great distance. FAR SPENT, in *OE.*, well advanced; nearly at an end; well passed away: see FARTHER and FURTHER.

FARAD, n. *făr'ăd* [after *Faraday*]: The unit of capacity: see ELECTRO DYNAMICS and UNITS SCIENTIFIC.

FARAD-MICRO: One one-millionth of a farad.

FARADAY, *făr'a-dā,* MICHAEL, D.C.L.: one of the most distinguished chemists and natural philosophers of the 19th century. 1791, Sep. 22—1867, Aug. 25; b. Newington, near London; son of a blacksmith. Faraday was a splendid instance of success obtained by patience, perseverance, and genius, over obstacles of birth, education, and fortune. He was early apprenticed to a bookbinder; yet devoted his leisure hours to science, and made experiments with an electrical machine of his own construction. Chance having procured him admission, 1812, to the chemical lectures of Sir H. Davy (q.v.), then in the zenith of his fame, he ventured to send to Davy the notes he had taken, with a modest expression of his desire to be employed in some intellectual pursuit. Davy seems to have at first endeavored to discourage him, but finding him thoroughly in earnest, soon engaged him as his assistant at the Royal Institution. He travelled with Davy to the continent, as assistant and amanuensis. On their return to London, Davy confided to him the performance of certain experiments, which led in his hands to the condensation of gases into liquids by pressure. Here he first showed some of that extraordinary power and fertility which have given his name celebrity, and which led to his appointment, 1827, to Sir H. Davy's post of prof. of chemistry in the Royal Institution. In the following summary his more important discoveries and published works are arranged, not chronologically, but according to various departments of science.

In chemistry, his treatise on *Chemical Manipulation,* 1827; 2d ed. 1842, is even now a very valuable book of reference. His *Lectures on the Non-metallic Elements,* and *Lectures on the Chemical History of a Candle,* delivered at the Royal Institution 1860, were published shortly afterward. Notable as discoveries or investigations of a high order are—New Compounds of Chlorine and Carbon, 1821; Alloys of Steel, 1822; Compounds of Hydrogen and Carbon, 1825; Action of Sulphuric Acid on Naphthaline, 1826; Decomposition of Hydrocarbons by Expansion, 1827; and the very valuable series of experiments 1829-30, on the manufacture of glass for Optical Purposes, which resulted in one of his greatest discoveries, mentioned below.

As practical applications of science, his Preparation of the Lungs for Diving, and Ventilation of Light-house Lamps, are conspicuous; also his celebrated letter on Table turning, and his lecture on Mental Education.

Of his publications on physical science, the most prominent are the Condensation of the Gases (already referred to): Limits of Vaporization, Optical Deceptions, Acoustical Figures, Regelation, Relation of Gold and other Metals to Light, and Conservation of Force. Of these, the condensation of gases into liquids and solids, though previously effected by others (and F. was ever foremost to acknowledge another's priority), he really made his own, not only by the extent and accuracy of his experiments, but by the exquisite experimental methods by which he effected the results. His ideas on regelation, and its connection with the motion of glaciers, have not had universal acceptance, though (see HEAT; ICE; GLACIER) there is no dispute as to his correctness in *facts*. In regard to Conservation of Force, there can be no doubt that he was led into a fallacy, by mistaking the technical use of the word *force* (see FORCE), for in his article on the subject he describes experiments made with the view of proving the conservation of *statical*, not *dynamical* force, whereas the doctrine of conservation asserts merely the conservation of 'energy', which is *not* statical force. He *may* be right also, but if so, it will be by a new discovery, having no connection whatever with 'conservation of energy.'

His Christmas lectures at the Royal Institution, though professedly addressed to the young, are profitable to all. His manner, his unvarying success is illustration, and his felicitous choice of expression, though the subjects were often most abstruse charmed and attracted all classes of hearers. *Lectures on the Physical Forces*, is a simple work, but in realty most profound, even is its slightest remarks.

But the great work of his life in the series of *Experimental Researches on Electricity*, published in the *Philosophical Transactions* during more than 40 years. Fully to understand all the discoveries contained in that extraordinary set of papers, would require a knowledge of all that has been discovered during that time as to Electricity, Magnetism, Electro-magnetism, and Diamagnetism. The following almost all, are discoveries of the *first* order. They are in the order of publication, nearly that of discoyery also: 1. Induced Electricity, 1831, comprehending and explaining a vast variety of phenomena, some of which have already been applied in practice (especially as Magneto electricity) to light-houses, electro-plating, firing of mines, telegraphy, and medical purposes. Electric currents derived from the earth's magnetism. 2. The Electronic State of Matter, 1831; 3. Identity of Electricity from different Sources, 1833; 4. Equivalents in Electro-chemical Decomposition, 1834; 5. Electrostatic Induction—Specific Inductive Capacity, 1838; 6. Relation of Electric and Magnetic Forces, 1838; 7. The Electricity of the Gymnotus, 1839; 8. Hydro-electricity, 1843; 9. Magnetic Rotatory

Polarization, 1846, effected by means of the optical glass already mentioned; 10. Diamagnetism and the magnetic Condition of *all* Matter, 1846; 11. Polarity of Diamagnetics and the Relation of Diamagnetism to Crystalline Forces, 1849; 12. Relation of Gravity to Electricity, 1851 (this as before remarked, is Faraday's attempt to prove a conservation of *statical* force). 13. Atmospheric Magnetism, 1851. An attempt to explain the diurnal changes of the earth's magnetic force by the solar effect on the oxygen of the air.

Faraday, who had received a pension 1835, was in 1858 appointed a house in Hampton Court. In 1862 he gave his last discourse on 'gas-furnaces;' and advocated the use of magneto-electric light in light-houses. In 1865 he resigned the position of adviser to the Trinity House, also that of director of the laboratory of the Royal Institution. See Life by Tyndall (1869), Bence Jones (1870), and J. H. Gladstone. (1872).

FARADIC, a. *fa-răd'ĭk* [F. *faradique*]: pertaining or relating to faradization. FARADISM: same as FARADIZATION.

FARADIC CURRENT: Old name for rapidly alternating current used in therapeutics.

FARADIZATION: see ELECTRICITY, MEDICAL.

FARALLONE ISLANDS, *fâ-râl-yō'nĕ:* cluster of six rugged, pointed islets in the Pacific Ocean, 23½ m. w. by s. of the Golden Gate, or entrance to the bay of San Francisco, Cal. The s.e. and largest extends nearly a m. e. and w., is 340 ft. high, contains numerous caves, and has a light-house on its tallest peak. All the islands are frequented by sea-gulls, murres, shags, and sea-parrots, beside rabbits and sea-lions; and are owned by a company which gathers the eggs of the gull and murre for the San Francisco market, where they command 25-35 cents per dozen.

FARANDOLA, n. *fâ-rân'dŏ-la* [F. *farandoule*]: dance popular among the peasants of the south of France and the neighboring part of Italy; called sometimes the Spanish Dance.

FARCE, n. *fârs* [F. *farce,* the stuffing in meat—from L. *farcīrĕ,* to stuff—*lit.,* force-meat or stuffing]: anything stuffed with foreign matters; a dramatic piece of a low comic character, full of exaggeration and drollery; any thing absurdly exaggerated. FARCED, a. *fär'sĕd,* in OE., stuffed. FARCEUR, n. *fâr-sėr* [F.]: writer of farces; a joker. FARCICAL, a. *fâr'sĭ-kăl,* of or relating to a farce; droll. FAR'CICALLY, ad. *-lĭ.—Farce* differs from comedy proper in degree and not in kind. The aim of both is to excite mirth; but while the former does so by a comparatively faithful adherence to nature and truth, the latter takes much greater license, and does not scruple to make use of any extravagance or improbability that may serve its purpose. It does not therefore, exhibit, in general, a refined wit or humor, but contents itself with grotesque rencontres,

and dialogues provocative of fun and jollity. The name is differently explained. In any case, it comes originally from the Latin *farcire*, to stuff, but while Adelung says that, in the middle ages, *farce* signified in Germany certain songs between the prayers during divine service, others derive it from the Italian *farsa*, this from the Latin *farsum* (stuffed); while Paolo Bernardi states that it comes from a Provençal word *farsum*, meaning a *ragout*, or mess of different ingredients, an opinion which has this in its favor—that the *dramatis personæ*, *Jack-pudding*, etc., were generally named after special dishes or mixtures. The first farces are said to have been composed by the society of the *Clercs de Bazoche* in Paris, about 1400, as a contrast to the ecclesiastical plays performed by the religious orders. The most widely celebrated and the oldest is the *Farce de Maître Pierre Pathelin*, which some assign to the 13th c., but which was more probably executed by one Peter Blanchet, about 1480. Subsequently, Molière elevated and refined the farce into pure comedy, in his *Médecin Malgré lui*, *Malade Imaginaire*, *Les Fourberies de Scapin*, and other inimitable productions. In England, the origin of the modern farce dates from about the beginning of the 18th c. It then began to be regarded as something distinct from comedy proper, and to constitute a special theatrical entertainment. Of the numerous farces which have been performed before English audiences, only those of Samuel Foote have kept a place in literature.

FARCY, n. *fâr′sĭ* [It. *farcina;* F. *farcin*—from mid. L. *farcimĭnŭm*]: a disease in horses allied to the glanders (q.v.) which it usually precedes and accompanies. The absorbent glands and vessels, usually of one or both hind limbs, are inflamed, tender, swollen, hard, and knotted. The vitiated lymph thus poured out softens, and ulcers, or farcy buds appear. Unlike the ulcers of glanders, they are curable, but require time and care. They must be scarified with the hot iron, which, to prevent their spreading, may also be gently run over the adjacent sound skin. Good feeding and comfortable lodgings are essential, and, if not interfering with the appetite, tonics, should be given, such as a drachm each of sulphate of copper and iodine, twice daily. FARCY-BUD, n. in *vet. surg.*, little tumor which appears on the face, neck or inside of the thigh of horses; generally the first indication of farcy.

FARDAGE, n. *fârd′ĭj* [F.]: in *naut.*, dunnage, loose wood, coir, etc., stowed among cargo to prevent it from shifting, or placed below dry goods to keep them from being injured by bilge-water.

FARDEL, n. *fâr′dĕl* [Sp. *fardillo*, a bale, a bundle: OF. *fardel*—from F. *farde*, a bale—from Ar. *farda*, one of two bales on a camel's humps]: in *OE.*, a little pack; a bundle: V. to make up in little bundles. FAR′DELLING, imp. FARDELLED, pp. *fâr′dĕld.*

FAR′DEL-BOUND: disease of cattle and sheep, consist-

ing in impaction of the fardel bag, or third stomach, with food, which is taken in between the leaves of this globular stomach, there to be fully softened and reduced. When the food is unusually tough, dry, or indigestible, consisting, for example, of overripe clover, vetches, or rye-grass, the stomach cannot moisten and reduce it with sufficient rapidity; fresh quantities continue to be taken up, until the overgorged organ becomes paralyzed, its secretions dried up, and its leaves affected with chronic inflammation. The slighter cases common among stall-fed cattle are 'loss of cud,' indigestion, and torpidity of the bowels. In severer form, there is also fever, grunting, swelling up of the first stomach, and sometimes stupor or epilepsy. The overgorged stomach can, moreover, be felt by pressing the closed fist upward and backward underneath the false ribs on the right side. The symptons often extend over ten days or a fortnight. Purgatives and stimulants are to be given. For a full-grown beast, give, in three or four bottles of water or thin gruel, ½ lb. each of common and Epsom salt, 15 ground croton beans, a dram of calomel, and two ounces of ginger. If no effect is produced, repeat this in 12 or 15 hours. Inject soap and water clysters every hour, withhold all solid food and allow only sloppy mashes, treacle and water, or thin linseed tea. An occasional bottle of ale, with an ounce or two of ginger, often expedites the action of the physic, and wards off nausea and stupor.

FARDINGALE: see FARTHINGALE.

FARDING-BAG, n. *fârd'ĭng băg:* the first stomach of a ruminant animal, in which green food lies until it is chewed over again; the rumen.

FARE, n. *fär* [Icel. *fær*, previous, passable; *feria*, a passage boat: Ger. *fähre;* Dut. *vaer*, a ferry: connected with succeeding FARE]: the price or sum paid for conveyance by land or water; a passenger; in *OE.*, a journey; a passage: V. in *OE.*, to go; to travel. FA'RING, n. a journey.

FARE, v. *fär* [Goth. *faran;* Icel. *fara;* Ger. *fahren*, to go, to get on]: to be in any state, good or bad; to get on; to feed; to be entertained; to happen: N. prepared food; provision; victuals; entertainment. FA'RING, imp. FARED, pp. *fārd*, got on; succeeded. TO FARE WELL or ILL, to be prosperous or the contrary.

FARE-FOLK, n. *fär'fōk* [etym. doubtful; probably for fairy-folk]: fairies; elves.

FAREHAM, *fär'ham:* market-town and sea-bathing place in the s. of Hampshire, England, on a creek at the n.w. end of Portsmouth harbor, 12 m. e.s.e. of Southamptom, 9 m. n.n.w. of Portsmouth. It has manufactures of earthenware. Pop. about 7,500.

FAREL, *fâ-rĕl'*, GUILLAUME: 1489-1565, Sep. 13; b. in Dauphiné: one of the most active promoters of the Reformation in Switzerland. He studied at Paris, and was dis-

tinguished at first by his extravagant zeal for the practices of the Rom. Cath. Church. 'Truly,' says he in one of his letters, 'the papacy itself was not so papistical as my heart.' Intercourse with the Waldenses, and with his friend Lefevre d'Etaples, induced him to study the Scriptures; the result was his conversion to Protestantism, and Farel, who was by nature vehement even to indiscretion, immediately commenced to proselytize. The chief scene of his labors was France and Switzerland. At Basel, 1524, Feb. 15, he opened his career of controversy and evangelization by publicly sustaining 30 theses on the points in dispute between Rom. Catholicism and Protestantism. In less than two months he was compelled to leave, mainly on account of a quarrel with Erasmus, whom, on account of his moderate or trimming policy, Farel had compared to Balaam. Farel went next to Strasbourg, afterward to Montbeliard where his iconoclastic way of preaching the gospel excited the alarm of his friends, several of whom, Œcolampadius among others, censured him sharply for his violence. His zeal was manifested next in the canton of Bern. It was chiefly through his exertions that the towns of Aigle, Bex, Olon, Morat, and Neuchâtel followed the example of Bern in embracing the Reformation. In 1532, he went to Geneva, where his success was at first so great, that on account of the agitation excited, he had to leave the city. He returned 1533, was again compelled to withdraw, but once more entered it 1534. This was his year of triumph; the Reformers filled the churches, and the Rom. Cath. clergy, who had made themselves odious to the citizens by abetting the despotic schemes of the Duke of Savoy, retired to Lausanne and Fribourg. In 1535, Aug., the town council of Geneva formally proclaimed the Reformation. Farel, however, was a missionary, not a legislator, and the organization of the Genevan Church passed into the hands of Calvin (q.v.). The severity of the new ecclesiastical discipline produced a reaction, and in 1538, Apr., the two reformers were expelled from the city. Farel took up his residence at Neuchâtel, where the reformed church was in deplorable disorder. He composed its differences, and drew up a constitution, which it accepted, after long and stormy debates, 1542. In Sep. he was fighting the battle of the Reformation at Metz. After his return to Neuchâtel, he frequently visited Calvin, whose authority in Geneva had been completely restored. It was on one of these occasions that he was present at the burning of Servetus, and though not, comparatively speaking, a bigoted Calvinist, he allowed his orthodoxy on that occasion to choke his humanity, exclaiming as the unhappy heretic uttered his last prayer to God from the flames: 'See what power the devil has over one who has fallen into his hands.' In 1557, with Beza, he was sent to the Prot. princes of Germany, to implore their aid for the Waldenses, and on his return—inexhaustible in his activity—he sought a new sphere of evangelistic labor in the regions of the Jura Mountains. When on the verge of three-score-and-ten, he married a young wife, much

to Calvin's disgust, who sarcastically speaks of him under the circumstances as 'our poor brother.' But neither his newly formed domestic ties, nor the infirmities of age, could quench his missionary zeal. In 1560-1, he went to his native Dauphiné, and passed several months at Gap, preaching against Romanism with all the ardor of his youth. In 1561, Nov., he was thrown into prison, but was soon rescued by his friends. In 1564, he paid a visit to the dying Calvin; his strength, however, was nearly exhausted, and he expired at Neuchâtel, leaving a son named Jean, who survived him only three years. Farel was a man of extensive scholarship, and wrote largely, but his works very inadequately represent the genius of the man. Compare Kirchhofer's *Das Leben Wilhelm Farels* (2 vols. Zurich, 1831-33), and C. Schmidt's *Etudes sur Farel* (Strasbourg, 1834); also his *Wilhelm Farel und Peter Viret* (1860).

FAREWELL, n. *făr'wĕl* [*fare* and *well*]: a kind wish or wish of happiness at parting; an adieu; Adj. leave-taking, as farewell wishes. Fare-you-well, ad., or Farewell, ad. good-by; adieu.

FAREWELL, *făr'wĕl*, Cape: see Cape Farewell.

FARGO, *fâr'gō*, N. Dak., city, capital of Cass co., on the Red River of the North, and the Northern Pacific, Great Northern, and the Chicago, Minneapolis & St. Paul railroads. There are also four branch roads, connecting with the foregoing. In 1871 the site of Fargo was comprised in an Indian reservation; 1873 the Indian title was extinguished, the town plotted, and named after William G. Fargo (1818, May 20—1881, Aug. 3), a director of the Northern Pacific railroad, and a pioneer in the express business. Then came a period of inactivity, occasioned by the financial panic and the cessation of the railroad construction. Late in 1875 the remarkable fertility of the region was demonstrated by the success of the great Dalrymple farm, and Fargo received a large share of the attention given that part of the n.w. In 1878 it had pop. less than 800, and in the following year the first decided and marked movement, so far as local development is concerned, was made. Since then unfailing crops, the completion of the railroad, the construction of several branch roads, and the energy of its citizens have made it one of the notable new cities of the great west. The municipal government is under the control of a mayor and council of 12 members, elected biennially. There are five banks with a combined capital of $550,000, deposits of more than $3,000,000, and clearances exceeding $35,000,000. Farm machinery business is the chief industry, with a trade in excess of $9,000,000 annually, including a large wholesale trade which extends generally over the northwest. The city is in the midst of the great agricultural region at the head of navigation on the Red River of the North, and it is one of the most important wheat-shipping centres of the country. It has the Holly system of waterworks; gas and electric

light plants; street railways; several daily papers and a number of weekly and monthly publications. There are several large grain elevators, planing and paper mills, extensive brick yards, and numerous minor manufactories. Among the public buildings are the Post-office, which accommodates the U. S. courts and the Supreme Court of the State; also a Masonic Temple, costing $80,000, which is used exclusively for Masonic purposes; the State Agricultural College; Congregational College; Catholic Seminary, and five Business Colleges. The annual post-office receipts amount to nearly $70,000, and the total post-office transactions to more than $700,000. Pop. (1910) 14,331.

FARIA Y SOUSA, *fâ-rē'â ē sō'zâ*, MANOEL: 1590, Mar. 18—1649, June 3; b. of an anc. family, at Caravella, province of Entre Minho e Douro, Portugal; historian and poet. He studied at the univ. of Braga, and entered the service of the Bp. of Oporto; but shortly after 1613 he went to Madrid, where, however, he did not long remain. In 1631, he obtained the office of sec. to the Spanish embassy at Rome, where his extensive acquirements procured him the notice of Pope Urban VIII. and of all the learned men of the city. After some time, he returned to Spain, and died at Madrid. F.'s writings are partly in Spanish, partly in Portuguese. Of the former, are, *Discursos morales y politicos* (2 vols. Madr. 1623-26), *Epitome de las Historias Portuguesas* (Madr. 1628), *Comentarios sobre la Lusiada* (2 vols. Madr. 1639), *Asia Portuguesa* (3 vols. Lisbon 1666-75), *Europa Portuguesa* (3 vols. Lisbon 1678-80), *Africa Portuguesa* (Lisbon 1681), and the greater portion of his poems, which he collected under the title of *Fuente de Aganippe o Rimas Varias* (Madr. 1644-46). F.'s poetry shows talent and spirit, but is on the whole tasteless and bombastic.—F. is not to be confounded with another Portuguese author of the same name (b. Lisbon 1581, d. Evora 1655), who was one of the most learned numismatists of his age.

FARIBAULT, *fă-rē-bō'*: city, cap. of Rice co., Minn.; on the Cannon river at its junction with the Straight river; on the Chicago, Milwaukee & St. Paul railroad; 15 m. n. of Owatonna, 53 m. s. of St. Paul. It contains a state asylum for the deaf, dumb and blind, fine courthouse, public library, Seabury (Prot. Episc.) Divinity School, Rom. Cath. acad. and convent, the Shattuck School, and other institutions. F. has piano, brick, wagon and furniture factories; flouring and woolen mills. There are several churches, banks and large public buildings. Pop. (1900) 7,368; (1910) 9,001.

A conditional transfer of the Rom. Cath. parochial schools in F. and Stillwater to the state authorities by Abp. John Ireland (q.v.) 1891 led to a spirited discussion in Rom. Cath. and Prot. circles, to the toleration of the scheme by the Sacred Congregation of the Propaganda and the pope 1892, and to the designation of the abp's.

educational arrangement as the 'Faribault plan.' The 'plan' was discontinued in Faribault 1893, owing to differences that arose between the school board and the ecclesiastical authorities over the assignment of two Protestant teachers to a building which had been rented from the Roman Catholics. On the advice of the archbishop the lease was annulled.

FARIDPUR, or FURREEDPORE, *fŭr-ēd-pôr′*, most western dist of the Dacca div., of Bengal, British India; bet. lat. 22° 47′ 53″ and 23° 54′ 55″ n., long. 89° 21′ 50″ and 90° 16′ e.; bounded n. and e. by the Ganges or Padma river, w. by the Chanduá and Madhumati rivers, and s. by Bakarganj; 2,267 sq. m. The surface in general is low, flat, and swampy, and 1,143 sq. m. are under cultivation, more than one-half in rice. Faridpur is traversed by 3 large rivers, navigable the year round by the largest Indian steam vessels, and these rivers have numerous small branches which accommodate flat and light draught boats. Beside the Eastern Bengal railroad, which extends 22 m. w. to e. in the n., Faridpur has 3 important railroads, the Calcutta and Jessor, 19 m. long, F. and Kalingar, 16 m., and the Faridpur and Talma 10 m. The whole dist. is frequently under water during inundations, and the huts of many villages are built on artificial elevations. Faridpur is advancing rapidly in prosperity under British administration.—Pop. about 1,800,000.

FARINA, n. *fă-rē′nă* or *-rī′-* [L. *farīnă*, meal—from *far*, grain: It. *farina:* F. *farine*]: meal or flour; the fine dust or pollen of flowers collected by bees for feeding their larvæ (see BEE); starch. FARINACEOUS, a. *făr′ĭ-nā′shŭs*, mealy; consisting or made of flour; capable of yielding flour or starch. FARINOSE, a. *făr′ĭ-nōs*, yielding or containing farina; in *bot.*, *entom.*, etc., covered with a light dust or powdery substance, like meal.—*Farina*, a term applied chiefly to a food product made from white maize, having grains coarser than those of meal, but finer than hominy. The name is also given to other similar substances prepared from wheat and other grains. Farina contains much starch, and food made of it is often called *farinaceous*. The farina of the different kinds of Pulse (q.v.), or seeds of leguminous plants, has considerably different properties.—Other farinaceous substances, consisting chiefly of starch, are obtained from roots—often from tubers—of plants of very different natural orders; some kinds also, as sago, from stems. Cassava meal, which contains with starch, much vegetable fibre and proteine or albuminous substances, is commonly called farina (*Farinha*) in many parts of S. America, where it is a principal article of food. —*Fossil farina, mountain milk*, or *Agaric mineral*, is a deposit of silicified animalcules, obtained from China, etc.

FARINELLI, *fâ-re-nĕl′lē* (real name, CARLO BROSCO); 1705, Jan. 24—1782, July 15; b. Naples: soprano singer. He studied music with Parpara, sang with great success in the leading Italian theatres, went to London 1734 and per-

formed in England three years, and after a brilliant season in Paris, settled in Madrid 1737. There he became the favorite of King Philip V. and of his successor Ferdinand VI., who paid him $10,000 per annum for singing to him exclusively. At his instigation Ferdinand organized a theatre in the royal palace, and Farinelli engaged and directed a company of eminent performers from Italy. He ruled the court 20 years, and was ordered out of the kingdom by Charles III. 1762.

FARINI, *fâ-rē'nē'*, Carlo Luigi: 1822-66; b. Russi, in Ravenna, in the n. of Italy: author and statesman. Having, with great success, studied medicine at Bologna, Farini first became known by several medical publications, and soon afterward by contributions to scientific periodicals. In 1841, 2, having entangled himself with politics, he was obliged to leave the Roman States, and change his residence repeatedly until he finally settled at Turin. The amnesty following shortly upon the accession of Pio Nono, opened to Farini not only his native country, but also a new career, through the liberal system inaugurated by the supreme pontiff. In 1847, he was called into the reformed ministry, as a substitute to the home sec.; in 1848, he was present in the suite of Carlo Alberto at Volta, and after the flight of the king, protested against the proclaiming of a republic. During the short ministry of the unfortunate Rossi (q.v.), Farini was director-gen. of the sanitary and prison dept. at Rome, from which post, however, he retired as soon as the reaction under Antonelli began to be established. Upon the occupation of Rome by the French, Farini, became once more an exile, but for a short time only, for in Piedmont he found a home as well as public honors. In 1850, he held the seat of minister of public instruction in the cabinet of Victor Emmanuel II., and on retiring from office, was named a member of the supreme council. When Central Italy resolved to annex itself to the kingdom of Victor Emmanuel, by means of universal suffrage, it was Farini who directed the popular mind with such admirable success that, on the day of ballot, not one vote was delivered asking for a separate kingdom. As gov. of Central Italy, he showed undaunted courage against the threats of Austria, and exhibited a thoroughly consistent moderation against the unruly promptings of the Mazzinians. The same qualities accompanied his measures when the newly acquired kingdom of Naples was to be reorganized. In 1861, Farini became minister of commerce and public works. In 1862, he took office as pres. of the cabinet, which he resigned 1863. It has been said that 'Farini was the mind of Italy, as Garibaldi was its sword.' Among his literary productions may be mentioned, *Il Stato Romano* (The Roman State), translated into English under the superintendence of the Right Hon. W. E. Gladstone (London 4 vols. 1859); *Storia d'Italia* (History of Italy), a continuation of Botta's celebrated work. Farini was also a contributor to Count Cavour's *Risorgimento.*

FARIS ECCHIDIAK: Arab poet and littérateur: b.

1796. In religion, he is a Syrian Christian. He studied at Cario under the ulamas of the mosque of El-Azhar. He was afterward invited to Malta by an English missionary soc., who wanted his services in their Oriental printing establishment. The dedication of a poem to the Bey of Tunis about 1847, induced that monarch to send a war-vessel to Malta, which brought the poet to Tunis, where he had a distinguished reception, and rich presents. Subsequently, he went to England, where he was employed in revising the text of a translation of the Bible into Arabic, by the Soc. for the Propagation of the Scriptures. In 1851, he published in London the New Testament in Arabic After residing in France—and publishing there, with M. G. Dugat 1854, a French grammar in his native tongue for use of the Kabyles of Algeria—he returned to London, and published his principal work, *La Vie et les Aventures de Fariak* (Paris 1855), a narrative interspersed with poems.

FARL, or FARLE, n. *fârl* [AS. *feorth-dael*]: in *Scot.*, one part of a scone or cake cut into four equal parts.

FARLEY, JOHN MURPHY: an American clergyman; b. 1842, April 20, in Dublin, Ireland; was educated at St. Joseph's Seminary, Troy, N. Y., and at the American College in Rome; ordained to the Roman Catholic priesthood in Rome, 1870; secretary to Archbishop McCloskey, 1872–84; and was appointed a domestic prelate by Pope Leo XIII., 1892. Three years later he was made auxiliary bishop of New York and consecrated titular bishop of Zeugma. He became archbishop of New York, 1902, Sept., succeeding the late Archbishop Corrigan. He was the author of a *Life of Cardinal McCloskey*, and of several magazine articles, including *Why Church Property Should Not be Taxed; Neither Generous nor Just;* etc.

FARLEY, *fâr'lĭ'*, MICHAEL: 1719–1789, June 20; b. Ipswich, Mass.: patriot and soldier. He was a member of the general court, delegate to the provincial congress, 1774–75, member of the house of representatives, and the supreme executive council, and for several years was maj.gen. of the 2d div. of Mass. militia.

FARLOW, *fâr'lō*, WILLIAM GILSON, M.D.: botanist: b. Boston 1844, Dec. 17. He graduated at Harvard Univ. 1866, and at its medical school 1870, spent several years in special study in Europe, was appointed adjunct prof. of botany at Harvard Univ. 1874, and was elected prof. of cryptogamic botany 1879. He wrote the *Progress of Botany* in the Smithsonian Institution Reports 1879–86, and has published *The Potato Rot* (Boston, 1875); *Diseases of Olive and Orange Trees* (1876); *The Gymnosporangia, or Cedar Apples of the United States* (1880); *The Marine Algæ of New England* (1881); *Introduction to Cryptogamic Botany* (1888), etc. He is a fellow of the American Assoc. for the Advancement of Science, and a member of the National Acad. of Sciences.

FARM. n, *fârm* [AS. *feorm*, a supper, hospitality; *feormian* to supply with food. F. *ferme*, an agreement,

a farm—from mid. L. *firma*, a feast, a farm—from *firmus*, durable, lasting—*lit.*, a portion of land which supplies food]: a portion of land employed to raise food: V. to let or lease at a certain rent, as a portion of land or taxes; to cultivate land. FARM'ING, imp.: N. the business of a farmer. FARMED, pp. *fârmd*. FARMER, n. *fârmėr*, one who cultivates land; one who leases taxes at a fixed rate. SYN. of 'farmer': agriculturist; husbandman; tiller; cultivator.

Farm, is a portion of land under cultivation or in pasture, often divided between the two, and not infrequently producing timber and wood for fuel. It may be divided into several, and even widely separated fields, but it forms a single property. In Great Britain a large proportion of the farms are leased from their proprietors by tenants who pay an annual rental. The length of the lease varies from one to 19 or more years. The landlord is supposed to furnish the requisite buildings but, when operations are conducted on an extensive scale, the tenant needs a large amount of capital with which to purchase live-stock, implements and machines, fertilizers and many other essentials to economical farm management. In sections of Scotland the rental is often made payable partly in grain: see FIARS. In all cases the landlord has a right of hypothec (q.v.) over the crops which enables him to prevent an unjust tenant from defrauding him. In continental Europe the tenure on which land is held varies in different countries. In many of these a specified rental is paid while in others the proprietor and tenant form a sort of partnership: see METAYER. In the United States many farms are rented, but the great majority are owned by their occupants. In the size of these farms there is a great variation. This is due to many causes, of which differences of climate, location, and the system of farming pursued, may be named as the most important. Where the winters are long and severe, and only a very limited variety of crops can be profitably grown while many which thrive in warmer regions cannot be grown at all, small farms will be the rule. In mountainous regions the cultivated area of land per farm will be small but the pastures and woodland may be of considerable extent. In such localities the land is difficult to cultivate and markets for its products are not easily reached. Small farms are also common in the vicinity of large cities and towns, and near manufacturing centres, because in such localities there is a large demand for products which can be most profitably obtained from fields of limited extent. In the Central West, the South, and on the Pacific Coast the natural conditions strongly favor the conduct of agricultural operations on an extensive scale. On the great prairies and rolling lands of these sections agricultural machinery, which has been brought to a marvelous degree of perfection, can be used to a vastly greater extent, and with a correspondingly greater profit, than it can be employed in the East. The systems of cultivations which go far toward

determining the size of farms are known as the extensive and the intensive. For the former comparatively large areas are required. The object of the cultivator is to obtain moderate crops per acre with a small outlay for labor and fertilizer. For him such crops are profitable because they cost him but little. The man who follows the intensive system requires but a small area of land. His purpose is to obtain large crops from a few acres. The cost per acre for labor and fertilizers is heavy and, except under most favorable conditions, the management of large fields under this system is out of the question. For the different crops, animals, and processes, see the respective titles: see also AGRICULTURAL EDUCATION: AGRICULTURAL SOCIETIES: AGRICULTURE.

Farm Buildings.—Structures erected for the protection and comfort of the farmer and his family, to shelter his live-stock, preserve his products, keep his implements and machines from damage by the weather, and furnish means for conducting the farm business in an economical manner. The most important, though not always the best constructed, of these buildings is the house. A half-century ago it was planned mainly for a shelter and even that purpose was not well served. As a rule it was cold and cheerless. There was little or nothing in the way of adornment and the facilities for doing the work which devolved upon the farmer's wife were meagre in the extreme. The other farm buildings, also, were poorly fitted to serve the purposes for which they were erected. Changes in the methods of farming, due to the increase of knowledge in general, the application of science to agriculture, and the introduction of machinery, have brought about a great change in the character and arrangement of the farm buildings. Increased prosperity, and the freer communication of rural communities with cities and towns have furnished the means and the incentive for obtaining the comforts of life, and the farmhouse of to-day is planned for a home instead of a place in which to barely live. In the planning of the modern barn the comfort of the animals, convenience of feeding them, economy of space in storing the farm crops, and means for lightening the labor of caring for the stock, are all carefully considered. And as in the house, so in the barn, attention is paid to proper ventilation and to sanitary conditions. The silo (q.v.) is sometimes built in the barn but on large farms should be a separate structure. Where the dairy is an important interest there should be a building in which to handle the milk. On such farms an ice-house is a necessity and on any farm it is highly desirable. Buildirgs in which to store the grain, and house the vehicles, implements and machines should be provided, and where wood is used for fuel a building in which it can be protected from the weather will be required. On large farms, or where special crops are grown, other buildings may be needed. The location for farm buildings should be carefully chosen and their

arrangement should be determined with a view to convenience and with regard to safety from fire.

Farm Labor.—The great diversification of industry during the past four or five decades, with the erection of immense shops, and mills, and factories, which employ great armies of laborers, has caused a serious diminution in the relative number of farm lands and has greatly increased the difficulty of making the farm profitable. The higher wages paid by manufacturers, and the attractions of the towns and cities in which factories are usually located, have led many who under former conditions would have cheerfully served as farm laborers to leave their country homes. At the same time the multiplied demands of the cities and of foreign markets for food stuffs have made it important to vastly increase the production of these materials. This makes a constant call for more laborers. Many have come from foreign lands, machinery, by means of which one man can cultivate as large an area as was formerly tended by several men, and the improvement in varieties which enables the farmer to obtain larger crops from smaller areas, have been helpful, but they are inadequate. Great losses are sustained by farmers from inability to secure their crops after they are grown. In 1906 the farmers of New York lost more than a quarter of a million dollars from this cause and in the West scarcity of labor at harvest caused a loss of many millions. How such losses can be prevented is one of the great problems of the farmers of the country.

FARMAN Elbert Eli: American jurist: b. New Haven, Oswego County, N. Y., 1831, April 23. He was graduated at Amherst College in 1855, and admitted to the bar in 1858 and to the United States courts in 1862. He studied international law in Berlin and Heidelberg, Germany, in 1864–7: was district attorney of Wyoming County, N. Y., in 1868–75; United States diplomatic agent and consul-general at Cairo, Egypt, in 1876–81; was a member of the International Commission to revise the judicial codes of Egypt in 1880–1; judge of the mixed tribunal of Egypt in 1881–4; and United States member of the International Commission which examined the claims of the inhabitants of Alexandria for losses arising from the bombardment in 1882, 1883, and 1884. He secured the obelisk Cleopatra's Needle as a gift of the khedive to New York, in 1879; made large collections of ancient coins and Egyptian antiquities which he gave to the Metropolitan Museum of Art in New York.

FARMAN, Ella. See Pratt, Ella Farman.

FARMER, Henry Tudor: American poet: b. England 1782; d. Charleston, S. C., 1828, January. While very young he emigrated to Charleston, S. C., where he continued to reside till his death. He published a small volume of poems entitled *Imagination, the Maniac's Dream, and Other Poems*, (1819); also an *Essay on Taste*.

FARMER, *fär'mėr*, John: 1789, June 12—1838, Aug.

13, b. Chelmsford, Mass.: genealogist. He spent the early part of his life teaching school and in business, and afterward applied himself to historical, antiquarian, and genealogical research. He was a founder of the N. H. Hist. Soc., and a member of numerous hist. and literary societies, published *Genealogical Register of the First Settlers of New England* (1829), *History of Billerica* (1806), *History of Amherst* (1820), *Gazetteer of New Hampshire* (1823), and contributed largely to the *Collections* of the H. H. and Mass. hist. societies.

FARMER, Lydia Hoyt: American miscellaneous writer: b. Cleveland, Ohio, 1842; d. 1903, Dec. 27. She was married to E. J. Farmer. Her works include: *Aunt Belindy's Point of View; The Doom of the Holy City; A Story Book of Science; A Knight of Faith; Short History of the French Revolution; Girls' Book of Famous Queens; What America Owes to Women;* etc.

FARMER, Richard, d.d.: 1735, Aug. 28—1797, Sep. 8; b. Leicester, England. He was entered a pensioner of Emmanuel College, Cambridge, 1753. In 1760, he took his degree m.d., and was appointed classical tutor of his college. It is not known when he took orders, but, while tutor, he acted as curate at Swavesey, a village eight m. from Cambridge. In 1766, he published his *Essay on the Learning of Shakespeare* (reprinted 1789, 1821) to show the sources whence the great dramatist derived his knowledge of the ancients. Farmer proved that it was from translations, and that Shakespeare has often recited the phraseology, and even the errors, of the translators. In 1775, he was elected to the mastership of Emmanuel College, and 1778, chief-librarian of the university. In 1780, he obtained a prebendal stall at Lichfield, which he resigned 1788 for the office of canon residentiary of St. Paul's.

FAR'MERS' ALLI'ANCE: association of farmers for advancing the interests of the agricultural population. The term Farmers' Alliance, in strictness, designated only one of many unions of farmers, but in common usage it was for some years applied to all the politico-social and mutual-benefit organizations of agriculturists in the United States. Though these bodies existed as separate organisms, each with constitution, by-laws, officers, etc., of its own, the aims of all were nearly the same, and efforts were made to unify them under a common name and a common constitution, or at least to procure their concurrent action for the common ends. The nature of these common ends may be understood from the demands made, 1880, Nov., by the national assembly of the Farmers' Mutual Benefit Assoc., which appear at the end of this article.

The first considerable organization of farmers for politico-economic purposes was the *National Grange of the Patrons of Husbandry:* see Husbandry, Patrons of. At the close of 1906 the Grange was organized in more

than 30 states, and the number of members was estimated at 800,000. Originally, the Grange did not contemplate organization of farmers for furtherance of agricultural interests through political action; the objects were rather mutual benefit, mutual improvement, commercial co-operation, and resistance to monopolies. In the 'Declaration of Purposes' it was, and still is, asserted, 'emphatically and sincerely,' that 'the Grange is not a political or party organization.' The Grange was founded in 1867, and the permanent organization of the National Grange was effected at Georgetown, D. C., Jan., 1873.

The National Farmers' Congress, one of the pioneer agricultural bodies, held its first meeting in Chicago, 1881. Like the Grange, it is non-political and it is widely different from the Alliance organizations. Its members are delegates appointed by the governors, or heads of the agricultural departments, of the different states. Its discussions are limited to broad national problems and it has secured some important legislation for the agricultural interests. It was the first farm organization to favor the interstate commerce law, rural free delivery of mails, reciprocity, and various other beneficent measures. Its 26th annual convention was held at Rock Island, Ill., Oct. 1906. John M. Stahl, of Chicago, is president.

A *Farmers' Alliance* was organized at Poolville, Parker co., Tex., 1879, by the exertions of William T. Baggett, who had, four years previously, effected a union of the farmers of Lampasas co., under the same name, for resistance to land and cattle speculators. Like the Grange, the new organization declared itself non-political. A union of the Farmers' Alliance (of Texas) with the *Farmers' Union*, a soc. of Louisiana farmers, was effected 1887, under the style *Farmers' Alliance and Co-operative Union of America*. The consolidated body sent organizers and lecturers into other states of the w. and s.w., and the order spread quickly through Mo., Ky., Tenn., N. C., S. C., Ga., Ala., and Miss. A similar organization, known as *The Agricultural Wheel*, had already been in existence for some years in Mo., Ky., and Tenn., having been founded 1882, at Des Arc, Prairie co., Ark. The 'Wheel' and the 'Alliance and Union' sent delegates to a convention at Shreveport, La., 1887, for effecting a union of the two bodies, which was accomplished the following year, under the title, *Farmers' and Laborers' Union of America;* the style was changed Dec., 1889, to *National Farmers' Alliance and Industrial Union.*

The *National Farmers' Alliance*, a body distinct from the last named, had its strength in Ill., Wis., Minn., Ia., the Dakotas, Neb., Kan., and Mo.; it had its rise in Cook co., Ill., 1877, as a local body; a national organization was effected 1880, when 50 delegates from local bodies in Mass., R. I., N. Y., O., Ind., Mich., Ill., Wis., Ia., Neb., Mo., Ky., and Tex. met for that purpose in Farwell Hall, Chicago. It grew rapidly and in 1890 claimed about 400,000 members. Against the wishes of

a large part of its supporters it became a political organization of somewhat radical type. The leaders endeavored to make the party represent measures which the farmers of the country did not approve. This led to its disintegration and final disappearance as a national body.

The Populist Party grew out of the Farmers' Alliance and drew strength from other sources. It was thoroughly political and favored the same kind of legislation as its predecessors. The organization was formed in 1891, held its first national convention in 1902, and its candidates for president and vice-president received 22 electoral votes. In 1896 and 1900 it nominated the Democratic candidate for president, but in 1904 it put forth a ticket of its own. In the height of its power it had several representatives, with senators from Kansas and South Dakota, in congress. It rapidly declined and in 1906, Dec., a meeting was called at Topeka, Kas., to formally disband the party. The attendance was small and the proposition was defeated.

The *Farmers' Mutual Benefit Association,* mentioned in the beginning of this article, had its rise in Johnson co., Ill., 1883, and was chartered under the laws of the state 1887. The local membership is given as 200,000, confined almost wholly to Ill. and Ind., though the assoc. has organizations in 10 other states. The declared objects of the assoc. are: 'to unite the farmers of Ill. and of the United States in all matters pertaining to their interests; to improve the modes of agriculture, etc.'; the 'declaration of purposes' of the order says nothing about political action, but the members are pledged 'promptly and fearlessly to place the stamp of condemnation on every business and profession which, in their judgment, is calculated to interfere with farmers' rights.'

The *Farmers' League* originated in Mass.; its specific objects are 'to advance the farmer's political welfare, securing to him due recognition and just representation in all elective and appointive offices affecting his welfare.'

The *Farmers' Union* was founded in Texas, Oct., 1902. Though strongest at the South it is designed to cover the entire country. It has several million dollars invested in warehouses and elevators in which to store the products of its members until a satisfactory price can be obtained. The organization is composed entirely of farmers. In 1906, Dec., its membership was about 70,000.

The objects and aims of the organizations named may be understood from the foregoing account: with the exceptions noted, the tendency of them all may be seen in the utterances of one of them—the National Farmers' Alliance and Industrial Union, which, 1890, gave expression as follows to its demands:

'We demand the abolition of national banks, and the substitution of legal-tender treasury-notes in lieu of national bank-notes, issued in sufficient volume to do the business of the country on a cash system—regulating the amount needed on a *per capita* basis, as the business

interests of the country expand; and that all money issued by the government shall be legal tender in payment of all debts, both public and private.

'We demand that congress shall pass such laws as shall effectually prevent the dealing in futures of all agricultural and mechanical productions, preserving so stringent a system of procedure in trials as shall procure prompt conviction, and imposing such penalties as shall secure most perfect compliance with the law.

'We demand the free and unlimited coinage of silver.

'We demand the passage of laws prohibiting the alien ownership of land, and that congress take early steps to devise some plan to obtain all lands now owned by aliens and foreign syndicates; and that all lands now held by railroad and other corporations, in excess of such as is actually used and needed by them, be reclaimed by the government and held for actual settlers.

FARM'ING'S ISL'AND: island in the n. Pacific Ocean, n. of the Sandwich Islands; lat. 30° 49′ n., and long. 159° 20′ w.; it was formally taken possession of, for the queen of England, 1861, Feb. 8, by her majesty's steamer *Albert*. The harbor was called English Harbor, and a point, on which there is a settlement, was termed English Point.

FARMINGTON, *fârm'ĭng-ton:* village of Hartford co., Conn.; on the Farmington river and the New Haven and Northampton railroad; 10 m. w. s.w. of Hartford, 31 m. n. of New Haven. This attractive village contains several churches, a savings bank, money order post-office, and several manufactories. Here for many years has been one of the most distinguished schools in the country for young ladies—an institution noted for scholarship and for refinement. The American Board of Foreign Missions, earliest missionary soc. in the United States, was organized in Farmington. Pop. (1910) 3,478.

FARMINGTON: village cap. of Franklin co., Me.; on the Sandy river; n. terminus of the Androscoggin div. of the Me. Central railroad; 36 m. n. w. of Augusta, 54 m. n. of Lewiston, 80 m. n. e. of Portland. There is a courthouse, States normal school, the Abbott Family School for Boys, the Wendell Institute for Girls, high and other schools at Farmington, also the Cullen Memorial Library. The American writers, Jacob and John S. C. Abbott, lived at Farmington and Lillian Nordica was born there. Pop. 3,330.

FARNE, *fârn* (or FEARNE, or FERN, *fërn*) ISLES (or the STAPLES): group of 17 islets and rocks, some visible only at low tide, two to five m. off the n.e. coast of Northumberland, England, opposite Bamborough. On one of the isles is the tower of a priory, built to the memory of St. Cuthbert, who spent the last two years of his life here. There is a hole called the churn, through which the sea rises. The passage among the isles is very dangerous in rough weather. Two of the islets have each a lighthouse. Here the *Forfarshire* was wrecked 1838 (see DAR-

LING, GRACE); and here, 1843, the *Pegasus* met the same fate, and 60 persons were drowned.

FARNESE, *fâr-nēz'*, It. *fâr-nā'zā :* illustrious family in Italy, whose origin can be traced to the middle of the 13th c., when it possessed the castle of Farneto, near Orvieto. Many of its members have filled the highest offices in the church.—In 1534, Cardinal ALESSANDRO FARNESE was raised to the papal see under the title of Pope Paul III. (q.v.), and as his great aim was the aggrandizement of his family, he erected Parma and Piacenza into a duchy, which he bestowed on his natural son, Pietro.—PIETRO LUIGI FARNESE was one of the most dissolute men of his period, and after many tyrannical attempts to limit the privileges of the nobles, he was assassinated 1547, Sept. 10. He was succeeded by his son OTTAVIO FARNESE (1520–85), who married a natural daughter of Charles V., and whose reign was marked by unbroken peace, and by various efforts made for the good of his subjects.

ALESSANDRO FARNESE (1546–92), son of Ottavio Farnese, served his first campaign under his uncle, Don John of Austria, and distinguished himself at the battle of Lepanto, 1571. He afterward followed his mother into the Low Countries, then in insurrection, and aided in the victory at Gembloux, 1578, Jan. 31. He was made gov. of the Spanish Netherlands by Philip II., and carried on the war against the Prince of Orange. The ill success of the expedition against England, to the command of which he had been appointed by Philip II., grieved him the more from its contrast to his former successes. On his return to the Netherlands, he was appointed commander-in-chief of the army dispatched to the assistance of the Rom. Catholics in France, and compelled Henry IV. to raise the siege of Paris. Being, however, ill supplied with provisions and money by Philip, and insufficiently supported by the League, he was forced to yield to the superior power of Henry IV., and died soon afterward at Arras. He was really an able warrior, and though severe in his discipline, was almost worshipped by his soldiery. RANUCCIO FARNESE (d. 1622), son and successor of Alessandro Farnese, had not the brilliant qualities of his father : he was sombre, austere, greedy and proud. A conspiracy was hatched against him, and Ranuccio was seized, and thrown into prison. ODOARDO FARNESE (1612–46), natural son of the preceding, was a prince remarkable for the elegance of his manners, also, according to Muratori, for his magnificence, magnanimity, and liberality.—The family became extinct in the person of ANTONIO FARNESE (d. 1731).

The name of the Farnese family has been bestowed on several celebrated works of art. These are—1. The *Farnese Palace* at Rome, built by Pope Paul III., before his accession to the holy see, after the design of Antonio da San Gallo. It is in the form of a quadrangle and was completed by Michael Angelo. The palace is one of the finest in Rome. The antique sculptures for which it was former-

ly renowned are now in the Museum at Naples; a few classic works, however, remain in the great hall. The gallery contains the frescoes of Annibal Caracci, which are very valuable, as exhibiting in the most complete manner the new line of art which he struck out. In a room adjoining the gallery, are some mythological fresco-paintings by Domenichino. 2. The *Farnesina*, a very elegant palace in Trastevere. It owes its celebrity chiefly to the frescoes of Raphael; but it contains frescoes also by Peruzzi, Sebastian del Piombo, and a colossal head in *chiaroscuro*, attributed to Michael Angelo. Among the antiques, formerly belonging to the Farnese family, now in the museum at Naples, are two which still bear the name of their original owners. 3. The *Farnese Bull*, a colossal group attributed to Appollonius and Tauriscus of Tralles, in Asia Minor, who probably belonged to the Rhodian school, and lived about B.C. 300. The group represents Dirce bound to the horns of a bull by Zethus and Amphion, for ill usage of her mother—a subject which, notwithstanding the vigorous treatment, is on the whole unsatisfactory. Pliny mentions the transference of the group to Rome, where it first adorned the library of Asinius Pollio, and afterward the Baths of Caracalla. It was discovered anew in 1546, restored by Bianchi, and placed in the Farnese Palace. 4. The *Farnese Hercules*, copied by Glykon from an original by Lysippus. It exhibits the hero, exhausted by toil, leaning upon his club; the muscles and veins are still swollen, the head inclined, the expression melancholy; one hand rests upon his back, and grasps one of the apples of the Hesperides.

FARNESS: see under FAR.

FARNHAM, *fârn'am:* town in the w. of Surrey, England, on the left bank of the Wey, 10 m. w.s.w. of Guildford. It consists chiefly of one street running e. and west. The principal feature is the stately old castle of the bishops of Winchester, built first by Bishop de Blois, brother of King Stephen. The castle was razed by Henry III., rebuilt and garrisoned by Charles I., and restored, 1684, to its present state by Bp. Morley. It is an embattled quadrangle of brick, covered with stucco. A new townhall was erected 1866. Farnham has belonged to the bishops of Winchester since 860, when Ethelbald of Wessex bestowed it on them. Some parts of the parish church were built in the 12th, 15th, and 16th c. The chief trade is in hops, a very fine variety of which is grown in the vicinity. William Cobbett was born and is buried here. Aldershott Camp (q.v.) is about 6 m. n. of Farnham. Pop. (1901) 6,124.

FARNOVIANS, n. *fâr-nō'vĭ-anz* [from *Farnovius*, latinized name of Stanislaus Farnowski]: in *eccles.* and *chh. hist.*, Polish Unitarian sect, which, under the leadership of Farnowski, separated from the rest of the Unitarian body 1568, and continued till their chief's death 1615.

FARNWORTH, *fârn'wėrth:* town of Lancashire, England; two miles and a half s.e. from Bolton-le-Moors, near the Tonge, a branch of the Irwell. It is a station on the Manchester and Bolton railway. It has a picturesque embattled chapel of the 15th c. The town is thriving, and there are manufactures of sail-canvass, watches, files, etc. Pop. (1901) 25,927.

FARO, or PHARO, n. *fär'ō* [It.]: game at cards of the nature of Hazard (q.v.), in evil repute as played chiefly for gambling purposes. FARO-BANK, n. bank or deposit of money against which the players play in the game of faro; gambling-house or room. See Hoyle's *Games.*

FARO, *fâ'rō:* pleasant and wealthy episcopal city of Portugal, cap. of the province of Algarve; in a plain at the mouth of the Fermoso, lat. 37° n., and long 7° 52′ w. It has, on the whole, a modern aspect, but its houses are not handsome, and its streets are in general narrow. It is surrounded with walls said to have been built by the Moors. The harbor of Faro is somewhat confined, but the roadstead formed by three islands at the mouth of the river affords good anchorage. Faro has considerable exports of oranges figs, anchovies, and cork. It has also a prosperous fishery. The number of blind people here is surprising, groups of five and six together being frequently observed. This is accounted for by the light sandy soil. Pop. 8,671.

FARÖE ISLES, *fā'rō* or *fā'rö'ė* [Dan. *Faar-Oen,* sheep-islands]: a group of islands, 22 in number, only 17 inhabited; belonging to Denmark, lying nearly midway between the Shetlands and Iceland, 61° 25′—62° 25′ n. lat., and 6° —8° w. long. The principal island, Stromoe (cap. Thorshavn), is 27 m. long, and 8 m. broad; those next in importance are Osteroe, Vaagoe, Bordoe, and Sudaroe; entire area nearly 500 sq. m. The Faröe Isles consist of basaltic elevation, none of which attain a height of 3,000 ft., and trap formations, covered with a thin vegetable soil, which yields pasturage to the cattle and numerous sheep. There are no considerable valleys or streams, but small fresh-water lakes are numerous. The coasts which are steep and lofty, are broken by deep inlets, and there are whirlpools and rapids which render navigation perilous. The furious winds which prevail prevent the growth of trees, or even of most of the ordinary vegetables and cereals; but the climate is so greatly modified by oceanic influences that notwithstanding the high latitude, snow rarely lies long on the ground, and the cattle can pass the greater part of the year in the open air. Peat and coal are used for fuel; traces of iron and copper, and opal, chalcedony, etc., are found. The chief sources of wealth are flocks of sheep, and multitudes of sea-fowl which frequent the rocks. The Islanders are skilful in climbing the dangerous cliffs in search of birds and they are expert in fishing for seals and whales. Their manufactures are of the homeliest kind, but in return for the numerous articles supplied to them by the mother-country, they yield tallow, train-oil, feathers, skins, and

butter to the Danish markets. The people are of Norwegian origin, a vigorous, laborious, loyal, and religious race, and belong to the Lutheran Church. They are governed by a Danish *amtmand,* or bailiff, and a landvogt, or director of the police and municipal departments, and are represented in the Danish legislature by a deputy appointed by the king. The islands were discovered in the 9th c. by Norwegians, and have belonged to Denmark since the incorporation of Norway with that kingdom by the Union of Calmar; and the language of the people is only a slightly modified form of the Old Norse. England held the islands from 1127 to the treaty of Vienna, in 1814. Some account of the Isles will be found in Prof. Sir Wyville Thomson's book, *The Depths of the Sea* (Macmillan & Co. 1873).—Pop. (1901) 15,230.

FAROESE, n. *fā'rō-ēz:* the language spoken in the Faroe Islands.

FAROLITE, n. *fā'rō-līt* [from the *Faroe Isles*]: a mineral of a pearly lustre, and a whitish or bluish color.

FARQUHAR, *fâr'kwâr* or *fâr'kėr,* GEORGE: 1678–1707; b. Londonderry, Ireland. He received his education at the Dublin Univ., where, though he did not take any degree, he secured the reputation of a wit who was a spendthrift of his witticisms. When he left the univ., he was engaged as an actor by one of the Dublin theatres, but, like most dramatists who have figured on the stage, he proved but an indifferent performer. Playing a part in Dryden's *Indian Emperor,* and forgetting that he wore a sword instead of a foil, he accidentally wounded a brother performer, and was so shocked by the occurrence that he at once quitted the boards. Accompanied by the actor Wilks, he went to London, and soon received a commission to the regt. commanded by the Earl of Orrery, then stationed in Ireland. Urged by Wilks, and perhaps stimulated by the gayety and leisure of a military life, he, 1698, produced his first comedy, *Love and a Bottle,* which proved a success. Two years afterward, his *Constant Couple* appeared, which had a brilliant reception, and to which he wrote a sequel, *Sir Harry Wildair.* In 1703, he produced *The Inconstant,* founded on the *Wildgoose Chase* of Beaumont and Fletcher, a version in which all the coarseness, and none of the poetry, of the elder dramatists is retained. He married in the same year, and falling into serious pecuniary difficulties, he sold his commission, and, struggling with adverse fortune, succumbed, and died of decline, leaving 'two helpless girls' to the care of his friend Wilks. During his last illness, he wrote the best of his plays, *The Beaux Stratagem*—in six weeks, it is said—and died while its wit and invention were making the town roar with delight.

Farquhar was one of the finest of comic dramatists, though Pope calls him a 'farce writer.' He was less icily brilliant than Congreve, and had on the whole more variety and character than any of his compeers. He had wit in abundance, but he had humanitv too. He was tender-hearted

and somewhat melancholy, and—what was rare in his school and in his time—*tears* are found glittering among the brilliants of his fancy.

FARR, *fâr*, WILLIAM, M.D., F.R.S.: 1807, Nov. 30—1883, Apr. 14; b. Kenley, in Shropshire, England: statistician. He became an asst.-surgeon at the Salop Infirmary 1826, and after attending privately the medical and scientific classes of the day, went to Paris Univ. 1829, where he attended the lectures of the most eminent medical professors. In 1831, he returned to England, and became a member of the Univ. of London, where he completed his professional curriculum. Farr applied himself mainly to a consideration of the important questions resulting from medical statistics. At first he found it very difficult to draw the attention either of the public or of medical societies to the subject; but in 1837, his article 'Vital Statistics,' in M'Culloch's *Statistics of the British Empire*, obtained notice and approval. In the same year, the registration of all the deaths, and of the causes of death, was begun in England, and 1838, Farr received an appointment in the gen. registrar's office. He was made supt. of a department which draws up the *London Tables of Mortality*, the *Quarterly Returns of Births, Deaths, and Marriages*, and the *Annual Abstracts*. In 1851, 61, and 71, he was engaged on the census. In 1872 he was chosen a corresponding member of the French Institute. In 1880, on the appointment of a new registrar-gen., Farr (who was a C. B.) withdrew from the public service. He wrote a *Statistical Nosology*, and valuable papers on Life Assurance, the Income Tax, etc. His *Vital Statistics*, a memorial volume, appeared 1885.

FARRAGO, n. *făr-rā′gō* [L. *farrāgō*, mixed food for cattle—from *far*, meal or flour]: a mixture of meal and other food for cattle; a confused mixture; a medley.

FARRAGUT, *făr′a-gŭt*, DAVID GLASCOE: first admiral, U. S. navy: 1801, July 5–1870, Aug. 14; b. Campbell's Station, Tenn.; son of a Spaniard who had served as officer on an American vessel in the Revolution. He was appointed midshipman in the navy and ordered to the *Essex* under Capt. Porter 1810, Dec. 10; had his first war experience when 12 years old, when as prize master he took a captured vessel to Valparaiso, and performed his first battle service in the engagement of the *Essex* with the *Phœbe* and *Cherub* in Valparaiso harbor, 1814, Mar. 28. He was commissioned lieut. 1825, commander 1841, capt. 1855. In 1861, Apr., he volunteered for active service, but it was not till the following year that he was congenially employed. In 1862, Jan., the govt. fitted out an expedition for the capture of New Orleans, placed him in command of the naval fleet, and assigned a force of 15,000 men under Gen. B. F. Butler to co-operate with him. Choosing the sloop-of-war *Hartford* for his flagship, he sailed from Hampton Roads Feb. 2 for Ship Island, 100 m. n.e. of the mouth of the Mississippi, and there awaited the land force

which left Fortress Monroe in transports Feb. 20. New Orleans was then defended against attack from the Gulf by Forts Jackson and St. Philip, 70 m. below the city, and by numerous gunboats, steam-rams, and fire-rafts. Farragut began bombarding Fort Jackson, Apr. 18, and, seeing no prospect of reducing it after a heavy fire of 6 hours, determined to attempt to reach the city by sailing past the two forts in the darkness. Shortly before daylight on Apr. 24, he ordered a general advance of the fleet. Both forts, the gunboats, and the iron-clad ram *Manassas* opened fire upon his vessels as they sped up the river, and the fire-rafts were ignited and directed down stream to oppose the advance. Of the fleet of 17 vessels, 13 passed the forts safely and destroyed the Confederate gunboats above as well as the *Manassas*. The *Brooklyn* silenced Fort St. Philip in passing. The action lasted 1½ hours, and caused a Union loss of 36 killed and 135 wounded. The city was occupied on the 24th, the forts surrendered to Com. Porter 28th, and Farragut turned over the command of the city to Gen. Butler upon his arrival with the army May 1. Farragut then desired to attack Mobile the same way, but the govt., anxious to open the Mississippi river its entire length, ordered him to co-operate with Gen. Grant in the campaign against Vicksburg. On June 28 he ran past the fortifications at that point, joined the Union iron-clad fleet above, and finding no army support at hand, repassed Vicksburg and returned to New Orleans. In these movements he was under fire 2 hours and lost 15 killed and 30 wounded. He was commissioned rear-admiral 1862, July 16. On 1863, Mar. 14, he attempted to send a fleet of 3 sloops-of-war and 3 gunboats lashed together and a side-wheel steamer past the Port Hudson batteries, but only one pair of vessels, the flagship and its consort, got through the fearful fire. On May 24 the combined naval fleets under Farragut, with the army under Gen. Grant, began operations against Port Hudson, and after its fall, July 9, Farragut sailed in his famous flagship for New York, where he rested 5 months while the vessel was undergoing repairs. In 1864, Jan., he returned to the Gulf, and began planning his long cherished attack on Mobile. On Aug. 5, with a fleet of 14 wooden vessels and gunboats and 4 iron-clad monitors, he passed Forts Morgan and Gaines as he had Forts Jackson and St. Philip, though with greater obstructions from submerged chains and torpedoes, and took possession of the bay, with a loss of 52 killed and 113 drowned. Fort Powell was blown up the next day, Forts Morgan and monitors, he passed Forts Morgan and Gaines has he had Gaines surrendered to the army a few days later, but the city was not occupied till 1865, Apr. 12. Farragut then returned home to recuperate his health. Congress created and gave him the grade of vice-admiral, 1864, Dec.; and created for him that of admiral, 1866, July 25; citizens of New York presented him a purse of $50,000; and swords of honor, public receptions, and banquets were freely tendered him. In 1867 he took command of the European squad-

ron and made a notable cruise; in 1870, Jan., performed his last naval service as commander of the fleet which received the remains of George Peabody in Portland harbor, Me. Farragut has a place among the most brilliant naval commanders. He was as modest as he was brave.

FARRAKHÁBÁD: see FURRUCKABAD.

FARRANT, a. *făr'rănt:* in *Scot.*, sagacious. FAR'RAND, a. in *OE.*, deep; cunning.

FARRANT, *făr'ant*, RICHARD: abt. 1530–81: composer of English church music. He was a gentleman of the Chapel Royal in the reign of Edward VI., and resigned on becoming master of the children of St. George's Chapel, Windsor, 1564. In 1568 he presented a play before the queen at Shrovetide, and on Christmas, 1569, was reappointed to the Chapel Royal, and later became a clerk and organist of St. George's Chapel. His compositions include *Call to Remembrance, Hide Not Thou Thy Face,* and according to some authorities, *Lord, for Thy Tender Mercies' Sake.*

FARRAR, *făr'ėr*, FREDERIC WILLIAM, D.D., F.R.S., Archdeacon of Westminster, England: b. Bombay, India, 1831, Aug .7; d. London 1903, March 22. He was educated at King William's College, Isle of Man, and King's College, London, and graduated at the Univ. of London 1850 and at Cambridge Univ. 1854. While a student he gained the chancellor's prize for English verse by his poem on *The Arctic Regions,* and Le Bas classical prize, and also became Norrisian prizeman. He was ordained deacon in the Established Church 1854, and admitted into priest's orders 1857; was appointed asst.-master at Harrow 1855; and was head master of Marlborough College 1871, Jan.—1876, Apr. In 1868, '74, '75, he was a select preacher before Cambridge Univ.; 1870 he preached the Hulsean lectures; 1869–73 was honorary chaplain to the queen; 1873 was appointed one of her chaplains in ordinary; 1876 became a canon of Westminster Abbey and rector of St. Margaret's; and 1883, Apr. 24, was appointed Archdeacon of Westminster. He was appointed Bampton lecturer before Oxford Univ., 1885, and the same year delivered a eulogy on Gen. Grant in the Abbey Aug. 4, and began a lecturing tour of the United States, Oct. Farrar contributed to Smith's *Dictionary of the Bible,* Kitto's *Biblical Cyclopædia,* and the *Encyclopædia Britannica;* and published among numerous works *Eric* (1858); *Julian Home* (1859); *St. Winifred's* (1863); *The Origin of Language* (1860); *Chapters on Language* (1865); *Greek Grammar Rules* (1865); *Greek Syntax* (1867); *Families of Speech* (1870); *Language and Languages* (1878); *Seekers after God* (1869); *The Witness of History to Christ* (1871); *The Silence and Voices of God* (1873); *The Life of Christ,* 2 vols. (1874) an exceedingly interesting and popular work; *Life and Works of St. Paul,* 2 vols. (1879); *The Early Days of Christianity,* 2 vols. (1882); *Eternal Hope; History of Interpretation* (1885); *Lives of the Fathers* (1889), a popular work; *The*

Bible: Its Meaning and Supremacy (1897); *The Herods* (1897); *The Life of Lives* (1899); *Temperance Reform; Texts Explained* (1899); etc.

FARRAR, JOHN, LL.D.: 1779, July 1—1853, May 8; b. Lincoln, Mass.: mathematician. He graduated at Harvard Univ. 1803, studied theol. in Andover Seminary, became Greek tutor at Harvard 1805 and Hollis prof. of mathematics and natural philosophy 1807, and held the latter chair till 1836. In 1818 he translated La Croix's *Elements of Algebra*, which at once became a text-book in the chief educational institutions of the country; and followed it with selections from Legendre, Biot, Bezant, and other mathematicians.—His second wife, ELIZA WARE FARRAR (1791–1870, Apr. 22; b. Flanders, Europe, dau. of Benjamin Rotch, New Bedford, Mass.), wrote *Children's Robinson Crusoe, The Story of Lafayette, The Story of Howard, Youth's Love Letters, Young Lady's Friend, Congo in Search of His Master*, and *Recollections of Seventy Years.*

FARRAR, TIMOTHY, LL.D.: 1747, July 11—1849, Feb. 21; b. Concord, Mass.: lawyer. He graduated at Harvard Univ. 1767; removed to New Ipswich, N. H., and taught school 1770; served in the revolutionary war and attained the rank of maj.; was appointed a justice of the N. H. court of common pleas after the war; became chief justice 1802, Feb.; and served altogether as judge over 40 years.—His son, TIMOTHY F., was law-partner of Daniel Webster, judge of the N. H. court of common pleas, and author of several legal works and reports.

FARREN, *făr'ĕn*, ELIZA, Countess of Derby: 1759–1829, Apr. 23; b. Liverpool: actress. She was daughter of an Irish surgeon who became an actor; made her first appearance on the stage at Liverpool 1773, and at London 1777, and married the 12th earl of Derby, 1797, May 1. She was a graceful actress, and a woman of rare beauty and estimable character.

FARRIER, n. *făr'rĭ-ĕr* [It. *ferrārĭă*, a smithy: F. *ferrer*, to shoe a horse: L. *ferrārĭŭs*, pert. to iron—from *ferrum*, iron]: a shoer of horses; a horse doctor. Some of the better class of farriers are men of shrewdness and observation, and sometimes considerable experience. Their management of sick horses is occasionally sensible, but generally quite empirical. They have usually but crude ideas of the structure, functions, or diseases of animals, and pin their faith mainly on a few carefully cherished recipes. To their calling as horse-doctors and shoeing smiths (see HORSE-SHOEING), they usually unite those of cow-leech and cutter of colts and pigs. Though still found in some rural districts, especially in England and Ireland, their practice is passing into the hands of regularly educated veterinarians: see VETERINARY MEDICINE. FAR'RIERY, n. *-ĕr-ĭ*, the place of business of a farrier; the trade or profession. ARMY-FARRIERS (Farriers-major, and farriers) non-commissioned officers in the calvary, artillery, engi-

neers, and military train, whose duty it is to shoe the horses of their corps, and, generally, to assist the veterinary surgeon in proper care over the regimental animals. They receive the same pay as other sergeants (with whom they rank); and, in addition, certain allowances proportionate to the number of animals in charge.

FARROW, n. *făr′rō* [AS. *fearh*, a little pig: O.H.G. *farah*, a pig: Sw. *farre*, a boar: Dan. *fare*, to farrow]: a litter of pigs: V. to bring forth pigs. FAR′ROWING, imp. FAR′ROWED, pp. *-rōd*. FARROW, a. [D. *vaarkoe*, *vaars*, a heifer or young cow that has not yet brought forth a calf]: applied to cows not bearing young in a given year or season.

FARS, *fârs*, or FARSISTAN, *fâr-sĭs-tân′*, (anc. *Persis*): province of Persia, on the e. shore of the Persian Gulf, between lat. 27° 30′ and 31° 30′ n., and between long. 49° 30′ and 55° e. The coast region is flat, with a hot climate; inland, the ground rises 2,000 to 3,000 ft., the climate is cooler, and valleys, remarkable for beauty and fertility, ranging from 15 to 100 m. in length, are numerous. East of this hilly district the province again becomes flat and sandy; and here is the large salt-lake Bakhtegan. The chief rivers are the Bundemeer (anc. Araxes), the Nabon, and the Tab (anc. Arosis). The province produces tobacco, wine, rice, dates, opium, linen, cotton, silk, cochineal, and roses for the manufacture of attar. It has iron and lead mines, marble and alabastar quarries, and yields also borax and naphtha. It trades mainly with India. The principal towns are—Shiraz, Jehroom, Darab or Darabgerd, Behbehan or Babahan, and Bushire. N. of Shiraz, about 30 m. lie the ruins of the ancient and splendid city of Persepolis. Fars contains also the remains of Shahphur, a city older than the age of Alexander the Great, and the celebrated sculptured rocks, called by the Persians *Naksh-i-Rustam*. A cold winter and heavy floods, 1873,4, caused great damage to property; nearly one-third of the city of Shiraz was destroyed by the floods.

FARSAN ARCHIPEL′AGO, *fâr-sân′:* group of islands in the s. e. of the Red Sea, the chief of which are Farsan Kebeer, 31 m. long. and Farsan Seggeer 18 m.; lat. 16° 30′—17° n., and long. 41° 45′—42° 10′ e. They would be valuable for harbors, were it not for the reefs in the vicinity.

FARTHER, a. *fâr′thėr*, or FURTHER, a. *fėr′thėr* [from *far* (see FURTHER)]: comp. of *far;* more distant or remote; longer: AD. more remotely; at or to a greater distance: CONJ. moreover; more than that. Superl. FARTHEST, or FURTHEST. *Note.*—FARTHER is applied to physical distance—FURTHER, refers to the progress of an argument or inference: the older forms are *fer*, *ferre*, *ferrer*, the *th* being inserted later.

FARTHING, n. *fâr′thĭng* [AS. *feorthling*, the fourth part of a coin—from *feorth*, fourth]: a small copper coin, the fourth part of a penny (q.v.).

FARTHINGALE, n. *fâr'thĭng-gāl* [old form of the word, found in Bp. Latimer; OF. *vertugade* and *verdugalle;* Sp. *verdugado,* a hooped petticoat—from Sp. *verdugo,* a rod or shoot of a tree]: a circle of whalebone formerly in use to spread a woman's petticoat to a wide circumference; a crinoline petticoat: see CRINOLINE.

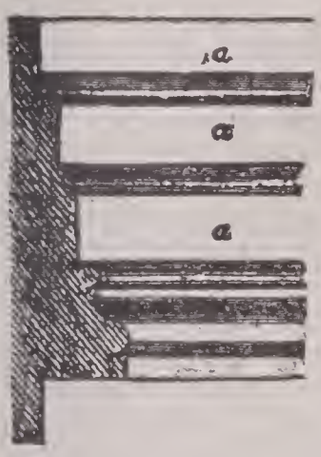
FARWELL, CHARLES BENJAMIN, American merchant and legislator: b. Painted Post, N. Y., 1823, July 1; d. Lake Forest, Ill., 1903, Sept. 23. Having gone in 1838 to Illinois, he was there engaged in farming and government survey work until 1844, when he entered a mercantile career in Chicago. He accumulated a fortune in the dry-goods trade. In 1869 he was a national bank examiner, in 1871–6 and 1881–7 a representative in Congress. From 1887 to 1891 he was United States senator, having been elected to fill the vacancy caused by the death of Gen. J. A. Logan. He was a figure of some prominence in both State and national politics.

FAR'YNDON INN: name formerly borne by Serjeants' Inn, Chancery Lane. This building belonged to the bishops of Ely, by whom, 1411, it was let to the serjeants-at-law. In 1484, the name was changed to Serjeants' Inn (q.v.).

FASANO, *fâ-sâ'nō:* town of Italy, province of Bari, 33 m. s. e. of the town of Bari; on the high road from that town to Brindisi. It is small, but wealthy. The whole of the district of Fasano abounds in olive plantations, and there are numerous oil presses in the town and neighborhood. The chief trade is in oil and wine. The cottages of many of the peasants have been made from the stone taken from old walls. Fasano was at one time a wealthy residential and commercial city. Pop. about 18,500.

FASCES, n. plu. *făs'sēz* [L. *fascēs,* a bundle of rods: It. *fascio*]: bundles of rods usually of birch, sometimes of elm, with an ax projecting from the middle of them, which were carried before the chief magistrates of anc. Rome, as symbols of their power over life and limb. They were borne by the lictors, at first before the kings; in the time of the republic, before consuls and pretors; and afterward before the emperors. Their number varied, a consul having twelve, and a pretor, six; but within the city only two. Valerius Publicola introduced a law that within the city the ax was withdrawn, except in the case of a dictator, who was preceded by twenty-four lictors, bearing as many fasces. Publicola also caused the fasces to be lowered at the assemblies of the people, as an acknowledgment of their supreme power. FAS'CIAL, a. *-shĭ-ăl,* pert. to the fasces.

FASCET, n. *făs'ĕt* [L. *fascis,* a bundle]: in *glass-working,* iron-wire basket on the end of a rod, to carry the bottle from the blowing-rod or the mold to the leer; called also a pontee.



Fascia.

FASCIA, n. *făsh′ĭ-ă*, FAS′CIÆ, n. plu. *-ĭ-ē* [L. *făscĭă*, a bandage, a swathe; *fascĭcŭlŭs*, a small bundle: It. *fascicolo* F. *fascicule*]: in *arch.*, a flat space or band, like a broad ribbon, usually between moldings on the architrave. Architraves are called single, double, or triple fasciæ architraves, according to the number of fasciæ into which they are divided. Also, a fillet; a surgical bandage; in *anat.*, a membranous expansion of connective tissue. FASCIALIS, n. *făs-sĭ-ā′lĭs* or *făsh-ĭ-ā′lĭs*, in *anat.*, long, small, and flattened muscle at the anterior part of the thigh; called also sartorius. FASCIATED, a. *făsh′ĭ-ā-tĕd*, bound with a bandage. FAS′CIA′TION, n. *-ā′shŭn*, in *bot.*, the union of branches or stems, presenting a flattened ribbon-like form: in *anat.*, act or manner of binding diseased parts. FASCICLE, n. *făs′sĭ-kl*, a little bunch; a cluster; in *anat.*, a bundle of muscular fibres. FASCICLED, a. *făs′sĭ-kld*, or FASCICULATE, a. *fă-sĭk′ū-lāt*, in *bot.*, collected, as it were, into a little bundle. FASCIC′ULAR, a. *-ū-lėr*, united or growing together in bundles or tufts. FASCICULARIA, n. *făs-sĭk-ū-lăr′ĭ-a*, in *zool.*, a genus of fossil polyzoa, occurring in the Tertiary rocks.

FASCIA: fibrous membrane which serves to support the muscles, binding them down, and preventing their slipping out of place.

FASCINATE, v. *făs′sĭ-nāt* [L. *fascĭnātus*, enchanted, bewitched: F. *fasciner*, to fascinate: comp. Gr. *baskainein*, to bewitch; Gael. *faisniche*, a prophet]: to enchant; to charm; to captivate; to allure by some powerful influence. FAS′CINATING, imp.: ADJ. charming; enchanting. FAS′CINATED, pp. FAS′CINA′TION, n. *-nā′shŭn* [F.—L.]: the act of captivating; a powerful influence over the affections or passions; an unseen and inexplicable influence.—SYN. of 'fascinate': to enrapture; enslave; bewitch.

FASCINATION BY SERPENTS: power long popularly ascribed to serpents, at least to some kinds of them, of fascinating by their eye the small animals on which they prey, so as to prevent the escape of the intended victim, when its escape would otherwise be easy, and to cause it rather to run or flutter into the mouth which is open to devour it. This popular notion has been ridiculed, but is supported by a large amount of evidence, and has been fully adopted by some most scientific observers. In the earlier part of last century, Kalm described the rattlesnake as frequently lying at the bottom of a tree, on which a squirrel is seated, and fixing its eyes on the little animal, which from that moment cannot escape, but begins a doleful outcry, comes toward the snake, runs a little away, comes nearer, and finally is swallowed. Le Vaillant describes a similar scene, witnessed by him in Africa, a shrike incapable of moving

away from a serpent which was gazing fixedly at it, and dying of fear, though the serpent was killed. Dr. Andrew Smith states that the presence of a non-venomous s. African tree-snake, *Bucephalus viridis*, in a tree, causes the birds of the neighborhood to collect around it and fly to and fro, uttering piercing cries, 'until some one, more terror-struck than the rest, actually scans its lips, and almost without resistance, becomes a meal for its enemy.' He adds, 'whatever may be said in ridicule of fascination, it is nevertheless true that birds, and even quadrupeds, are, under certain circumstances, unable to retire from the presence of certain of their enemies; and what is even more extraordinary, unable to resist the propensity to advance from a situation of actual safety, into one of most imminent danger. This I have often seen exemplified in the case of birds and snakes; and I have heard of instances equally curious, in which antelopes and other quadrupeds have been so bewildered by the sudden appearance of crocodiles, and by the grimaces and contortions they practiced, as to be unable to fly, or even move from the spot toward which they were approaching to seize them.' Ellis, in his *Three Visits to Madagascar*, records anecdotes of the same kind; one in particular, of a frog apparently unable to move, until an object was pushed between it and the eye of the snake, when the frog immediately darted away, as if relieved from some mesmeric influence.

FASCINE, n. *făs-sēn'* or *făs'sēn* [F. *fascine*, a hurdle, a fascine—from mid. L. *fascīna*, a bundle of wood]: fagots for military purposes, made of young branches of trees or brushwood, also of osiers, bound together with yarn or withes. They are about 12 inches in diameter, and of various lengths, averaging 12 ft., according to the object for which they are intended. Fascines are used in the construction of temporary works, to make earth stand at a slope steeper than it would assume naturally; for filling a ditch, and sometimes, in a pile, for setting fire to an obstruction. Before a siege, the soldiers are employed in making fascines in great number; and when needed, each soldier bears one to the place, casts it on the heap, and the quantity required is thus accumulated in a remarkably short time.

FASCIOLA, *făs-sĭ-ō'la:* generic name formerly denoting all the *Trematode Entozoa*, as Flukes, etc., which are now divided into many genera.

FASCIOLARIA, n. *făs-sĭ-o-lär'ĭ-a* [L. *fasciola*, a bandage]: in *zool.*, genus of gasteropodous mollusks, belonging to the family *Muricidæ*. They occur in warm and southern seas; in *paleon.*, fasciolaria commence their existence in the Cretaceous rocks.

FASH, v. *făsh* [OF. *fascher;* F. *fâcher*, to vex, to tease]: *Scot.*, to trouble; to vex; to tease: N. trouble; vexation. FASH'EOUS, a. *-us*, troublesome. FASH'ING, imp. FASHED, pp. *făsht*. TO FASH ONE'S THUMB, to give one's self trouble, said to be in allusion to the use of the thumb in making a bargain.

FASHION, n. *făsh'ŭn* [F. *façon*, the form or make of a thing: OF. *faceon*, form, shape—from L. *factiōnem*, a making or doing: comp. Gael. *fasan*, the fashion]: the make or form of anything; the prevailing mode or form of dress; the mode or style usual among persons of good breeding; custom; general practice; in *OE.*, a spelling for FARCY, which see: V. to mold; to shape; to make; to form; in *OE.*, to counterfeit. FASH'IONING, imp. FASH IONED, pp. *-ŭnd.* FASH'IONER, n. one who. FASH'IONABLE, a. *-ŭn ă-bl*, according to the established mode; prevailing at a particular time; dressing or behaving according to the usages of good society; well-bred. FASH IONABLENESS, n. *-bl-nĕs.* FASH'IONABLY, ad. *-ă-blĭ.* FASH'IONABLES, n. plu. *-ă-blz*, persons of fashion. FASHION-MONGER, *-mŭng-gĕr* [see MONGER]· in *OE.*, one who makes fashions an engrossing study.—SYN. of 'fashion, n.': manner; method; practice; habit; usage; make; form; style; shape; appearance, mode; pattern; model; workmanship; execution; sort; way;—'fashion, v.': to figure; fit; adapt; accommodate.

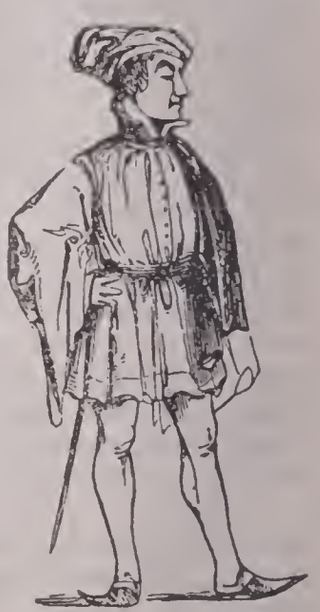
FASHION, in clothing, or, as the French term it, *La Mode:* prevailing style of dress. It admits as little of exact definition as of being referred to any intelligible principle. In every age and country, there has been a recognizable costume or general style of male and female attire, with certain niceties in the shape, color, and texture of dress, which, fluctuating according to taste or whim, are known as the fashion—a word which etymologically signifies making in a particular form. The terms fashion and fashionable are, however, so comprehensive as to include much beyond the sphere of the toilet; as, for example, a style of speaking, living, and forming opinions; there being, to use a common phrase, 'a fashion in everything.' It is only in China and some other eastern countries that, in consequence of dress being regulated by sumptuary laws or equally strict traditions, the fashions of attire remain from generation to generation with little or no change. (For the nature and necessity of clothing, see WEAVING: SANITARY SCIENCE).

A glance at the leading forms of dress and more conspicuous fashions that have prevailed in W. Europe, particularly in England, since the dawn of civilization, shows that modern costume seemingly had a double origin—that of the Romans and of the Teutonic people, who in different branches invaded France and Britain. The usual Roman dress, in the latter period of the Empire, consisted of a tunic, or loose upper garment, with a dress for the lower limbs, called *braccæ;* hence the modern term *breeches.* Over all was occasionally worn by the higher classes the *toga*, or mantle. It is believed that these Roman costumes were generally copied by the greater number of British, at least among the more opulent classes. In the dress of the women, however, there was but little change. They appear in two tunics, the one reaching to the ankles, the other having short sleeves, and reaching about half-way down the thigh: in other words, they resemble a round gown, or bedgown and petticoat, though the latter, distinct from a

body and sleeves, is not considered ancient. This tunic was called in British *gwn*; hence our word *gown*, of which specimens of short dimensions are still worn by women of the humbler classes in England, Scotland, and Wales.

The Anglo-Saxon and Danish periods of English history are marked by new peculiarities in costume. Soon after the departure of the Romans, and the arrival of the Saxons in the 5th c., fashions of apparel were introduced from N. Germany, which continued with no material change for several centuries. The most important improvement in the ordinary dress of the people was the introduction of the *shirt*, a linen garment worn next the skin, for which we are indebted to the Saxon invaders. The common dress of the 8th c. consisted, as we find, of linen shirts; tunics, or a kind of surcoat; cloaks fastened on the breast or shoulders with brooches; short drawers met by hose, over which were worn bands of cloth, linen, or leather, in diagonal crossings. Leathern sandals were worn by the early Anglo-Saxons; but afterward the shoe became common: it was very simple, and well contrived for comfort, being opened down the instep, and there, by a thong passed through holes on each side of the slit, drawn tight round the feet like a purse. A felt or woolen cap, called *hæt* (hence our modern word *hat*), was worn by the higher class of Anglo-Saxons; but it is generally believed that the serfs or lower orders were without any other covering for the head than what nature had given them. The Anglo-Saxon tunic still exists in the *smock-frock*, a species of overall worn generally by the peasantry and some farmers in England, and more rarely in the United States. The *blouse*, worn by workmen in France and Switzerland, has an equally early origin.

The Norman Conquest brought greater taste and splendor into British costume. Now were introduced gloves (q.v.), with the fashions of chivalry. The annexed engraving represents a gentleman of the reign of Henry V.: he is dressed in a short tunic, buttoned in front, with girdle, large loose sleeves, tight hose forming pantaloons, and stockings in a single piece, peaked shoes, and head-cloth or cap. About this period, silks, and velvets of divers colors came into use among the higher classes, by whom gold chains were generallly worn. The dress of ladies was of the richest kind. Gowns were embroidered and bordered with furs or velvets; and the bodice, laced in front over a stomacher, now first appeared. But the greatest eccentricity was the lofty steeple head-dress, shown in the annexed portrait; this consisted of a roll of linen, covered with fine lawn, which hung to the ground or was mostly tucked under the arms.



Gentleman of Fifteenth Century.

Lady of the Fifteenth Century.

In the 16th c., the upper part of the long hose or nether garments began to be worn loose, or slashed with pieces of different colors let in, and the arms and shoulders of the doublet or jacket were fashioned in a similar style. Boots also were worn loose on the leg, with the upper part falling down; hence the origin of the *buskin*. Ruffs or ruffles, collars, and vetvet bonnets with feathers, likewise came into use, as may be seen from the paintings of Henry VIII. Hall, the chronicler, describes several of Henry's superb dresses, and among them a *frocke*, or coat of velvet, embroidered all over with gold of damask, the sleeves and breast cut and lined with cloth of gold, and tied together 'with great buttons of diamonds, rubies, and orient pearls.' The cloaks and mantles were of corresponding magnificence. The shirts were pinched or plaited, and embroidered with gold, silver, or silk. The term *hose* continued to be applied to the entire vestment, from the waist to the feet, throughout this century: the material is more distinctly stated, for Henry wore knit silk as well as cloth hose: the precise period of the separation of the hose into breeches and stockings, is not so clear as the derivation of the latter term from the '*stockying* of hose;' 'that is, adding the lower part that covered the legs and feet to that which was fastened by points to the doublet,' and was called the *stocks*. The shoes and buskins were of the German fashion, very broad at the toes, and of velvet and satin, slashed and puffed. The hats, caps, and bonnets were of almost endless forms and colors.

Man and Woman of the Sixteenth Century.

The dress of the middle ranks in the reign of Henry VIII. may be seen in prints of the time; plain russet coats, and a loose kind of kersey breeches, with stockings of the same piece, were the ordinary suit; and the London apprentices wore blue cloaks in summer, and gowns of the same color in winter, as badges of servitude: for this appears to have been the age of domestic distinctions—the relics of the feudalism of the middle ages. The women wore russet, or long woolen gowns, worsted kirtles (hereafter called *petticoats*), and white caps, and aprons; and white underlinen came into general wear. The engraving shows a man and woman in the ordinary dress of this period.

The principal novelty of the reigns

of Edward VI. and Mary was the flat round bonnet or cap, of plain velvet or cloth, worn on one side of the head, and decorated with a jewel and single ostrich feather. The bonnet itself is preserved in the caps worn at the present day by the boys of Christ's Hospital; and their blue coat and yellow stockings are such as were worn by the London apprentices at the date of the foundation of the hospital by the youthful Edward. See HOSIERY.

The male costume in Elizabeth's reign was the large trunk hose, long-waisted doublet, short cloak, hat, band, and feather, shoes with roses, and the large ruff; but the great breeches, 'stuffed with hair-like woolsacks,' after the separation of the hose into this garment and stockings, appear to have been worn throughout the reign; they were made of silk, velvet, satin, and damask. The doublets were still more costly, and quilted and stuffed, 'slashed, jagged, pinched, and laced;' and over these were worn coats and jerkins in as many varieties as there are days in the year. The cloaks were of the Spanish, French, and Dutch cuts, of cloth, silk, velvet, and taffeta of all colors, trimmed with gold, silver, and silk-lace and glass bugles, inside and outside equally superb. The stockings, shoes, slippers, and ruffs resembled those of the ladies. *Hats* now began to supersede the bonnets of a former era. Those of beaver were exceedingly expensive, and they were for the most part made of felted wool, dyed. The most remarkable thing about these hats was their numerous shapes; some were steeple-crowned; others were flat and broad, like the battlements of a house; and others with round crowns, and bands of all colors, and ornamented with huge feathers and brooches, clasps, and jewels of great value. See HAT.

As regards female attire, the more conspicuous features in the reign of Elizabeth were the farthingale (q.v.) and ruff. The farthingale, or fardingale, consisted in an extravagant expansion of the lower garments, by means of cane or whalebone, by which the lady seemed to walk in a kind of inverted tub. The farthingale, referred to by Shakespeare, Butler, and other writers, mostly in a satiric vein, was the predecessor of the hoop, which in its turn, after an interval, was succeeded by the Crinoline (q.v.) and hoop-work of steel. The widely extended ruff of fine linen, like a huge frill, is seen in the pictures of Elizabeth and her envied rival, Mary Queen of Scots, both stars of fashion in their day.

Under James I., the male costume was somewhat more Spanish, as respects the slashing and ornamenting of the doublet and breeches. Late in the reign, however, the jackets or doublets were shortened, and the breeches reduced in size, and fastened in large bows at the knees; the well-stockinged leg was admired, and the hat worn low in the crown, and with broad brim, as seen in portraits of date 1619. Beards and whiskers had become almost universal in the reign of Elizabeth; but in that of James, the former was sometimes worn trimmed to a point, hanging down at the division of the ruff.

In the female costume, there was little change. The farthingale continued to be worn by ladies of quality; a strong passion for foreign lace was introduced; pearls were the favorite jewels; and the ruff maintained its sway, so as to be anathematized from the pulpit: and the fancies of female costume were glanced at in a sermon preached before the king at Whitehall 1607—8, as 'her French, her Spanish, and her foolish fashions.'

The fashion of dress in the reign of Charles I. became still more decidely Spanish and picturesque. There were now worn collars of rich point-lace, large and hanging down on the shoulders, held by a cord and tassel at the neck, and now called *Vandyke*, from its being the most striking part of the dress in which Vandyke at that time painted portraits. The principal habits were vests and cloaks of velvet, or silk damask, short-trousered breeches terminating in stuffed roles, and fringes and points, and very rich boots, with large projecting lace tops. A dress of Charles I. is thus described: A falling band, green doublet (from the armpits to the shoulders wide and loose), zigzag turned-up ruffles, long green breeches (like a Dutchman's), tied below the knee with yellow ribbons, red stockings, green shoe-roses, and a short red cloak lined with blue, with a star on the shoulder; the king sometimes wore a large cravat, and at other times a long falling band with tassels. The dress of the gay courtiers or cavaliers consisted of a doublet of velvet, silk, or satin, with large loose sleeves, slashed, and embroidered; Vandyke collar and band, and short embroidered cloak, worn on one shoulder; the long breeches, fringed and pointed, met the ruffled tops of the boots; the embroidered sword-belt was worn over the right shoulder, and in it was hung a Spanish rapier, and in the flapping beaver-hat was worn a plume of feathers confined by a jewel. A buff coat or jerkin was often worn, as a better defense than the doublet, which is sometimes covered. The engraving represents a citizen of this period more plainly attired.

Citizen in the time of Charles I.

The female costume of this period was rather elegant than splendid. Gowns with close bodies and tight sleeves were worn, though the farthingale was retained, with a gorget ruff standing up about the neck like a fan. French hoods were still worn, though with little distinction as to rank. The hair was worn in small curls, and the hoods, of all colors, fastened under the chin with curious effect. Earrings, necklaces, and bracelets, were much worn; but the Puritan women were expected to forego lace, jewels, or even braided hair; and they retained the close hood and high-crowned hat. Toward the close of the reign

of Charles I., the cumbrous farthingale disappeared, with the yellow starched ruff and band. These tasteless fashions being dismissed, the female dress became very elegant, with its rich full skirt and sleeves, and falling collar edged with rich lace, and the hair worn in graceful ringlets; but these vanities were condemned by the Puritan party in an extreme reaction from the unbridled extravagance and luxury of the court.

With the restoration of Charles II. came certain tasteless innovations upon the elegant Vandyke costume of the time of Charles I., which were the first resemblance to the coats and waistcoats of the present day. Thus the most picturesque English attire lasted little more than a quarter of a century. Its decline was gradual; its chivalric character soon degenerated into grotesqueness, which in its turn changed to stark meanness. Early in the reign of Charles II., the doublet was much shortened, and worn open in front, where, and at the waistband, the rich shirt was shown; and the loose sleeves and breeches were decked with ribbons and points, and from the knee-bands hung long lace-ruffles. At the wrists, too, ruffles were worn; but the lace-collar was shorn of its points. The cloak was retained upon the left shoulder, and the high-crowned and plumed hat remained for a short time; but the crown of the hat was soon lowered. The petticoat breeches were another absurdity; although ornamented with ribbons at the sides, the lining strangely appeared below the breeches, and was tied at the knees; to match which, the sleeves of the doublet reached only to the elbows, and from under them bulged the ruffled sleeves of the shirt, both ornamented with ribbons. Meanwhile the skirt of the doublet had been lengthened from above the waist nearly to the knees, and had buttons and button-holes in its entire length, thus becoming a *coat*, and so named in an inventory of 1679; wherein also are the items of *waistcoat*, *breeches*, *pantaloons*, *drawers*, and *trousers*, being the earliest mention of these articles. Stockings of various kinds were common; and 'the lower ends of stockings' are understood as socks. Instead of the lace-collar was worn the long square-ended cravat, of the same material, from Brussels, and Flanders.

Passing to the reigns of James II. and William III., we find the male attire gradually fashioned according to the artificial costume of the court of Louis XIV. Every article of dress was now more prim and exact. The petticoat breeches were exchanged for the close-fitting garments tied below the knee, and therefore called *knee-breeches;* the broad-brimmed hats were turned up on two sides, and edged with feathers or ribbons; the rich long lace cravat and embroidered waistcoat appeared; and the band was now narrowed, so as to resemble that worn at the present time by clergymen of some denominations. Wigs, which had been some time in use, were worn still longer than hitherto, hanging down in front, or flowing upon the shoulders, though the color was altered from black to suit the complexion. From the 17th to the end of the 18th c. was the era of *Hair-powder* (q.v.), *Wigs* (q.v.), and cocked-

hats: in these as in other matters there was excessive artificiality in the tastes of the higher classes In the annexed cut, is a representation of a gentleman of 1750, with his flowing coat and ample cuffs, frills at the wrist, deep waistcoat hanging over the legs, long white hose drawn over the knees, his cocked-hat folded under his arm, and in his hand the open snuff-box (q.v.). Such was the appearance of what is traditionally known as the 'old English gentleman.' The coats of the 18th c. were of velvet, silk, or satin, as well as broadcloth, and their colors very fanciful. Hogarth's favorite color was sky-blue; Reynolds's deep crimson and violet; and Goldsmith rejoiced in plum-color. About 1790, cloth became the general wear; the waistcoat being of the costlier materials, and embroidered, and sometimes the breeches. Buckles were worn at the knees and in the shoes till the close of the century; and the large square plaited buckle was the *ton* until 1791, when shoe strings became general. Among the artificialities of dress during the greater part of the 18th c., none was more odious than that of hoops (q v.), worn by ladies, who, by these means of expansion, were again made to appear as if standing in an inverted tub. In the reigns of George I. and II., a loose kind of drapery at the back of the dress, called a *sacque*, and hooded silk cloaks, were worn, also a very small muff, such as have been lately revived. In the 18 c., after the disuse of towering headdreses veils (q.v.) of an elegant fabric were introduced, and the fan (q.v.) was an important article for ornament and flirtation.

Gentleman of 1750.

The formalities of the 18th c. received a severe blow at the French Revolution; and in the ten years, 1790–1800, a more complete change was effected in dress, by the spontaneous action of the people, than had taken place at any previous period in a century. The change began in France, partly to mark a contempt for old court usages, and partly in imitation of certain classes of persons in England, whose costume the French mistook for that of the nation generally. This new French dress was introduced by the party who were styled the Sans Culottes. It consisted of a round hat, a short coat, a light waistcoat, and pantaloons; a handkerchief was tied loosely round the neck, with the end; long and hanging down, and showing the shirt-collar aboves the hair, was cut short, without powder, *à la Titus*, and the shoes were tied with strings. The comparatively simple form of dress of the Sans Culottes found many admirers in England, and soon became common among young men; the change from antique fashions was greatly helped also by the imposition of a tax on the use of hair-powder, which was henceforth generally abandoned.

Pantaloons, which fitted closely to the leg, remained in very common use by those persons who had adopted them till 1814, when the wearing of trousers, already introduced into the army, became fashionable. It is proper, however, to mention that trousers had, for the previous 15 or 20 years, been used by boys, and were perhaps from them adopted by the army. Previous to the French Revolution, the dress of boys was almost the same as that of men. Although trousers—improperly called by some Americans *pants*—were generally worn after 1815, many elderly persons still held out in knee-breeches against all innovations, and to the present day an aged gentleman may occasionally be seen clinging to this 18th c. piece of dress. The general use of white neckcloths continued, notwithstanding the introduction of the standing collar, till the reign of George IV., when this monarch's taste for wearing a black silk kerchief or stock, and also the use of black stocks in the army, caused a remarkably quick abandonment of white neckcloths, and the adoption of black instead. The year 1825, or thereabouts, was the era of this signal improvement in costume.

While these leading changes were effecting, other alterations, less conspicuous, were from time to time taking place. The disbanding of the army after the peace of 1815 led to various transformations besides those above mentioned. While pantaloons were the fashionable dress, it became customary to wear Hessian boots; these, which had originated among the Hessian troops, were without 'tops;' and were worn with small silk tassels dangling from a cut in front; being drawn over the lower part of the pantaloons, they had a neat appearance; but the keeping of them clean formed a task that prevented their universal use: see Boots. When trousers were introduced from the practice of the army, the use of Wellington boots to go beneath them also became common. Referring to the era 1815–25 as that in which trousers, Wellington boots, and black neckcloths or stocks came into vogue, we may place the introduction of the surtout in the same period. From the time when the collarless and broad-skirted coat had disappeared about the commencement of the century, the fashion of coats had changed in various ways till the above-named era, when the loose frock-coat or surtout was added to the list of garments.

Such is a general account of the progress of fashions in England until nearly the present day. In these fashions, the Welsh, Irish, and Scotch, and in later times the Americans, have participated, and there is now little to distinguish the inhabitants of one of these countries from those of another. For what differences exist in particular localities —as, for instance, the round hats of the women in Wales, the checked gray *plaid* of the Lowland Scottish peasantry, and the *tartan* of the Highlanders—see the respective titles.

The general simplifying of dress subsequent to 1815, was not unaccompanied by an expiring effort to sustain a high style of fashion. The *macaroni*, or highly dressed beau of

the 18th c., was now succeeded by the *danay*, who, with mincing, affected manners, prided himself on his starched collars, his trouser-straps, and the flashy bunch of seals which dangled from his watch-chain. The Regency was the era of this kind of supreme dandyism, but it continued till later times, and characterized a number of leading public personages, of whom notices occur in Raikes's *Reminiscences*, 1831–51. In the present day may be noted a kind of break-down of everything like formality in gentlemen's walking costume. Plain cloths, of divers hues, called tweeds (q.v.), have almost superseded materials of a superior quality; cloth caps, or soft felted hats, called *wide-awakes* (see HAT), cover the head, and the feet are provided with short ankle boots instead of Wellingtons. In evening or dinner costume, however, the old etiquette of dress-coats and white neckcloths is maintained. Among the changes that are taking place in the morning dress, or at least that for walking and exercise, none is so remarkable as the growing fashion of wearing *knickerbockers*. These are wide loose trousers to below the knee, leaving the lower part of the leg only stockinged or covered with leggings. This fashion, copied immediately from the French Zouaves (q.v.), and partly perhaps from the common practice of stuffing the lower parts of the trousers roughly into boots in the western regions of the United States, is very much a resumption of the costumes seen in old Dutch prints. Should it become general, leg-gaiters or boots will come again into use, and the present generation may live to see the fashion of male attire work once more round to the knee-breeches of the 18th c. In female as well as in male costume, fashion seems to have a tendency to work in a circle; of this, the late but now obsolete, resumption of the farthingale, or hoop, under the name of crinoline, offers a sufficient example, besides affording a ludicrous instance of the unreasoning manner in which extravagances in dress are usually followed. It is to be observed, however, that Englishwomen, chargeable with whatever absurdities in dress, set a creditable example to their sex all over the world, in allowing no fantastic change of fashion to prevent them from taking out-door exercise in all weathers, which the introduction of india-rubber goloshes (q.v.) has materially aided.

As to the moral view that may be taken of the whimsicalities of female fashions, we might refer to the numerous papers of Steele in the *Tatler* and *Spectator*, and also to the writings of other 18th c. essayists, passing those over, it is enough to quote the words of Hazlitt, a more recent essayist. 'Fashion,' he says, 'constantly begins and ends in two things it abhors most—singularity and vulgarity. It is the perpetual setting up and then disowning a certain standard of taste, elegance, and refinement, which has no other formation or authority than that it is the prevailing distraction of the moment; which was yesterday ridiculous from its being new, and to-morrow will be odious from its being common. It is one of the most slight and insignificant of all things. It cannot be lasting, for it

depends on the constant change and shifting of its own harlequin disguises; it cannot be sterling, for, if it were, it could not depend on the breath of caprice; it must be superficial, to produce its immediate effect on the gaping crowd; and frivolous, to admit of its being assumed at pleasure by the number of those who affect to be in the fashion, to be distinguished from the rest of the world. It is not anything in itself, nor the sign of anything, but the folly and vanity of those who rely upon it as their greatest pride and ornament. It takes the firmest hold of weak, flimsy, and narrow minds, of those whose emptiness conceives of nothing excellent but what is thought so by others. That which is good for anything is the better for being widely diffused. But fashion is the abortive issue of vain ostentation and exclusive egotism; it is haughty, trifling, affected, servile, despotic, mean and ambitious, precise and fantastical, all in a breath—tied to no rule, and bound to conform to every rule of the minute.' For a large variety of amusing particulars concerning fashions, 'stars of fashion,' etc., during the past two centuries, see Mrs. Stone's *Chronicles of Fashion* (Lond. 2 vols. 1845).

FASKIDAR, n. *făs'kĭ-dâr* [etym. doubtful]: in *ornith.*, the Northern Gull. *Larus parasiticus*, now *Lestris cataractes.*

FASQUELLE, *făs-kĕl'*, Jean Louis, F.B., LL.D.: 1808–1862; b. France: educator. He removed to the United States 1834, spent some years in teaching languages, was appointed prof. of modern languages and literature in the Univ. of Mich. 1846, and held the office till death. He published *A New Method of Learning the French Language* (1854); *Télémaque, with Notes and Grammatical References; Colloquial French Reader* (1854); *Napoleon, with Notes;* and *A General and Idiomatical Dictionary of the French and English Languages.* His French text-books had a large sale in the United States and in England.

FASSAITE, n. *făs'sā-īt*, or Fas'site [from *Fassathal*, in the Tyrol]; the name applied to a pale green to pistachio or dark green variety of augite, or aluminous pyroxene (q.v.). It occurs in metamorphic, marly limestone in the Fassathal, Tyrol.

FASSETT, *fas'ĕt*, Cornelia Adèle Strong, American artist: b. Owasco, N. Y. 1831, Nov. 9; d. Washington, D. C. 1898, Jan. 4. She studied in New York as well as in Paris and Rome, and from 1875 lived in Washington, where she painted portraits of many prominent statesmen. Her most important work is *The Electoral Commission in Open Session*, including the portraits of some 200 persons.

FASSETT, Jacob Sloat, American lawyer and capitalist: b. Elmira, N. Y. 1853, Nov. 13. He was graduated from Rochester University 1875, and was admitted to the bar 1878. He was State senator 1884–90 and was defeated as Republican nominee for governor in the year last named. He is the proprietor of the Elmira *Daily Advertiser*, and controls mining, banking, and other interests in the Western States and in Korea.

FAST, a. *făst* [AS. *faest;* Icel. *fastr;* Swed. *fast;* Ger. *feste,* firm, unbroken, rapid in succession: mid. L. *fasté,* immediately: comp. Gael. *fas,* to increase]: close; immovable; firmly fixed; without leaving an interval, as, to follow *fast;* faithful, as a *fast* friend; rapid in motion; quick; speedy; extravagant; dissipated and gay, as a *fast* man; wild: AD. with quick steps; rapidly; firmly. FAST'LY, ad. *-li,* firmly: surely. FAST'NESS, n. *-nĕs* [Ger. *festung,* a place of security]: a stronghold; a place of unbroken defense. FASTEN, v. *făs'n,* to fix firmly; to bolt or bar; to seize and hold on. FASTEN'ING, imp. *făs'nĭng:* N. anything that binds or makes fast. FASTENED, pp. *făs'nd.* FASTENER, n. *făs'nĕr,* he or that which fastens. FAST AND LOOSE, changeable; inconstant (see below). FAST BY, close or near to. IT RAINS FAST, the drops fall close on each other.—SYN. of 'fasten': to fix; stick; link; cement; attach; annex; affix; secure.

FAST, v. *făst* [Goth. *fastan:* Icel, *fasta,* to hold, to keep: Ger. *fassen;* Dut. *vatten,* to seize, to hold: comp. Gael. *fastadh,* to bind one's self, to engage: connected with preceding]: to abstain from food beyond the usual time: N. the abstaining from food for a certain time, or from particular kinds of food as flesh; a religious mortification or humiliation by abstaining from food; the time of abstaining from food. FAST'ING, imp.: N. act of abstaining from food. FAST'ED, pp. FAST'ER, N. one who abstains from food. FAST-DAY, a day set apart for special religious worship and humiliation.—*Fasting* is abstinence from food, either partial, when the restriction is confined to certain articles of food; or total when all sustenance is dispensed with for a specified time. The origin of the custom seems to be coeval with man's first experience of the salutary influence which abstinence exercises on the health, and with his more or less instinctive consciousness of the necessity of retaining the body in due subjection to the soul. By degrees, the self-mortification which it implied raised it into a sacrifice offered to the Deity; it became a religious observance, was surrounded with rites and ceremonies, and finally came to bear the stamp of a divine law. Climate, the habits of a people, and their creed, gave it at different periods different characteristics; but it may be pronounced a recognized institution with all the more civilzied nations, especially those of Asia, through all historic times. It was in high estimation among the ancient Parsees of Irania. It formed a prominent feature in the ceremonies of the Mysteries of Mithras; and found its way, together with these, over Armenia, Cappadocia, Pontus, and Asia Minor, to Palestine, and northward to the wilds of Scythia. The ancient Chinese and Hindus, principally the latter, carried fasting to unnatural excess, in accordance with their primeval view—which they held in common with the Parsees—of heaven and hell, salvation and damnation, of the transmigration of the soul, and of the body as the temporary prison of a fallen spirit. Although the Vedas attach little importance to the excruciation of the body, yet the Pavaka. by the due observance of which the Hindu believer is purified

from all his sins, requires among other things an uninterrupted fast for 12 days. Egypt seems to have had few or no compulsory general fasts; but it is established beyond doubt, that for the initiation into the mysteries of Isis and Osiris, temporary abstinence was rigorously enforced. In Siam, all solemn acts are preceded by a period of fasting, the seasons of the new and full moon especially being consecrated to this rite. In Java, where abstinence from the flesh of oxen is part of the religion of all, Buddhists and worshippers of Brahma alike, the manner and times of the observance vary according to the religion of the individual. Again in Thibet, the Dalai-lamaites and Bogdo-lamaites in common hold this law. That Greece observed and gave a high place to occasional fast-days such as the third day of the festival of the Eleusinian mysteries, and that, for instance, those who came to consult the oracle of Trophonius, had to abstain from food for 24 hours—is well known. The Romans did not omit so important an element of the festivals and ceremonies which they adopted from their neighbors, though with them the periods of fasting were of less frequent recurrence. See THESMOPHORIA.

As to the Semitic races, although we find the people of Nineveh undergoing occasional fasts, to which even animals were made to conform, yet the Mosaic law set apart for fasting one day only in the whole year. The 10th day of the seventh month (Tishri), called 'the Day of Atonement' (Yom Kippur), or, as the holiest of the whole year, 'the Sabbath of Sabbaths,' was ordained for 'the chastening of the *Nephesh*,' which the traditional law explains as meaning the strictest and most rigorous abstinence from all food or drink, as also from washing, anointing, the putting on of sandals, etc., from the sunset of the ninth to the rising of three stars on the evening of the tenth day. In process of time, five days of compulsory fasting were added, in commemoration of certain days of humiliation and national misfortune—viz., the 17th of the fourth month (Tamus), as the anniversary of the taking of Jerusalem both by Nebuchadnezzar and Titus; the 3d of the seventh month (Tishri), when Ishmael had killed Gedaliah, the Jewish governor appointed by the Babylonians (Jer. xli. 2); the 10th of the tenth month (Tebeth), in remembrance of the siege of Nebuchadnezzar; the 13th of the twelfth month (Adar), the fast of Esther, and the day most rigorously kept, next to the great Day of Atonement:—the 9th of the fifth month (Ab), anniversary of the destruction of the first temple by Nebuchadnezzar, and of the second by Titus. That the people had at all times been prone to attach great importance to the use of this penance as a visible sign of outward contrition, is clear from that ordinance of the Mosaic law which puts into the hands of the head of a family the power of confining self-imposed vows of abstinence within due limits. The community had a desire to express their penitence for sin, or their grief on the death of great men, by occasional fastings Fastings were also considered efficient in averting the divine wrath, insuring victory over an enemy, or bringing down rain from heaven.

Besides, fasting was frequently with those who wished to free their minds from all hindrances to meditation, as in the 40 days of Moses (Ex. xxxiv. 28), or the fast of Daniel (Dan x. 2, 3). This fast of Contemplation, as it might be called, seems also to have been the model imitated by the Cabbalists, some of whom are known to have fasted from Sabbath to Sabbath. In later times, when, after the destruction of the temple, sacrifices had ceased, fasting, as causing a decrease in the flesh and fat of the individual, was considered in some degree a substitute for the animal which had formerly been offered up by the priest. From an aid to repentance and inward purification, which purpose alone it had been originally intended to serve, it became an end and a virtue in itself; an abuse, indeed, neither unknown nor undenounced even in the days of the prophets. If we add to this the endless chain of dire calamities and ever-renewed persecutions of which the Jews have been the victims for many a long century, the ever-increasing number of their fasts commemorative of deaths and tribulations will not be surprising. Most of these, however, which were superadded from time to time, soon fell into oblivion. Besides the six already mentioned, few entire days are now observed by the orthodox, and these merely of local observance. Fasting, with the Jews, always implies entire abstinence, and lasts, except on the Day of Atonement and the 9th of Ab—when the sunset of the previous evening is the sign for its commencement—from the break of the day to the appearance of the first three stars. Sackcloth and ashes, the garb of the penitent in ancient times, are no longer worn; but as the special holiness of the Day of Atonement is celebrated by various solemnities (see FESTIVALS), so the deepest mourning over the loss of temple and country is visibly expressed by many ceremonies in the Jewish synagogues and homes on the 9th of Ab. On that day also, to add individual to national sorrow, the cemeteries are generally visited. Of several half-days of fasting that have survived, are the first two Mondays and the first Thursday in the second month (Iyar) and in the eighth month (Cheshwan), (sheni vachamishi vesheni), in celebration of the two meeting-points of summer and winter; also, several days before the New-year or Day of Judgment, and before the Day of Atonement. The individual is bound to commemorate by fasting the anniversary of the death of his parents, his own wedding-day until the performance of the marriage-ceremony, and the birth of his first-born male child (till its 13th year—when the duty falls upon the child himself), on the day preceding the Pesach (Pasha)—in commemoration of the sparing of the Israelite first-born in Egypt. For the several hours' fasts on the two New-years' Days, and on the first six days of the Feast of Tabernacles, see FESTIVALS. The Sabbath causes the postponement of any fast—that of the Day of Atonement only excepted—which may happen to be coincident with it; and children—girls till their 12th, boys till their 13th year—pregnant women, and the sick, are exempted from the observance

FAST.

In the time of Christ, fasting, as we have seen was in high estimation. The Mondays and Thursdays—the market-days, on which the judges sat, and the law was read in the synagogues—were especially set aside for this purpose by the Pharisees. The Essenes fasted even more frequently. The Sadducees alone took exception to this rite, and were therefore considered ungodly. Christ himself neither approved nor disapproved of the custom, but, as in all matters of ceremony, allowed his disciples, Jews and Gentiles, to act according or contrary to their old habits. He allows and uses the privilege, but is distinctly against such a *commandment*, and even excuses those who do not fast. His own abstinence from food for 40 days was like that of Moses, entirely an individual act; and against a voluntary and limited imitation of such abstinence, to which the spirit might move a man, no objection whatever was to be taken. Rom. Catholics, however, maintain that all the words of our Lord, which to Protestants appear to discountenance the obligation of fasting, are directed exclusively against the ostentatious and self-reliant fasts of the Pharisees. They even understand the language which he used in condemning the practice of the Pharisee fasters, as containing a direct exhortation to his own disciples—not that they should abstain from fasting—that they should fast with suitable dispositions. They hold, moreover, that in exempting his disciples from fasting, he had regard only to the actual time of his own presence among them. It was incongruous, he said, that the children of the marriage should fast as long as the bridegroom was with them; but he added, 'the days will come when the bridegroom shall be taken away from them; *and then they shall fast in those days*' (Mk. iii. 20; Matt. ix. 15). Hence they infer, that from the time of our Lord's ascension the practice of fasting became obligatory on his disciples, the temporary cause of the exemption hitherto existing having ceased By Protestants it is held that during the first centuries of Christianity, voluntary fasts were frequent; the new converts adhering in most cases to their old rite, only taking care to change the days, which had been days of abstinence in their former religions, for others. Besides, fasts were considered a befitting preparation for holy acts and feasts, for ordination and Baptism. The time mostly observed annually in common by all were the 40 hours from Friday afternoon to Sunday morning, during which time Christ lay in the sepulchre. But not before the end of the 2d c. was anything like an ordinance promulgated with respect to fasting in the new religion. It was first Montanus who, as the pretended Paraclete, introduced, among other laws of excessive rigor, fasting, as an inhibition upon the faithful. The Wednesdays and Fridays, as the days when Christ was taken prisoner and crucified, were made days of strictest abstinence from all food; while on the other days of the week, dried, uncooked victuals only were allowed. Asceticism and monachism had their share in the gradual development of the doctrine of the necessity of mortifying the flesh, and as a natural consequence in the growth and

diffusion of the custom of fasting. Yet, in the first six centuries, the difference in the various Christian communities was not greater in any other doctrine or ceremony than in this. Bishops and councils, however, gradually fixed the times and seasons for the whole of Christendom. The 40 hours had gradually become 40 days, called the Quadragesima; and the Council of Orleans, 541, made it binding upon every Christian not to eat any meat during this time, save only on the Sundays. However, here again Rom. Catholics dissent strongly from the Prot. view of this history. They admit that the followers of Montanus did introduce greater rigor and frequency into their fasts; but they deny that before the time of Montanus the practice of fasting was not fully recognized in the Christian Church, and regarded as strictly obligatory; since, as they allege, the very earliest allusions to the 40 days' fast of Lent (*tessaracosté*) regard it as an established and recognized institution. Their claim is that the very first fathers who allude to it, speak of it as 'handed down and observed by the church;' and that so far is its origin from being ascribable to the influence of Montanism, that, on the contrary, the earliest relaxations which the church admitted were a reaction against the excessive and intolerable rigor of that fanatical sect. Returning to the general flow of church-history, we note that the eighth council at Toledo, 7th c., declared those who ate meat during Lent, sinners unworthy to partake in the resurrection. From the 8th c. to the 11th, when a gradual reaction set in, the laws of fasting and the punishments awarded to the transgressors became stricter and stricter; interdict and excommunication were among the penalties. By degrees fasts had become so numerous and different in kind, that they were divided into—1. Jejunium generale (a fast binding for all); 2. Consuetudinarium (local fast, etc.); 3. Penitentiale (atonement for all transgressions); 4. Votivum (consequent upon a vow); 5. Voluntare (for the better carrying out of an undertaking). These, again, were kept as 1. Jejunium naturale (entire abstinence from food or drink, especially in preparation for reception of the Eucharist); 2. Abstinentia (certain food only being allowed, but several times a day); 3. Jejunium cum abstinentia (the same food, but taken only once a day); and 4. Jejunium sine abstinentia (all kinds of food, but only once a day). The food prohibited on partial fast-days included, during certain periods, not only the flesh of quadrupeds, fowl, and fish, but also the 'lacticinia'—i.e., all that comes from quadruped and bird, as butter, eggs, milk, etc. The discrepancies and differences of opinion with respect to the times and modes of fasting, or to the food prohibited, even among successive popes and contemporary bishops and elders of the church, were so numerous, and involved in such obscurities, that the church historians themselves shrink from enumerating them. Suffice it to say, that they gradually developed in the Rom. Church into—1. Weekly fasts, of which Friday, as the day of the crucifixion, seems to have been early and generally observed. To this was added the Wednesday, as

the day on which the death of Christ was resolved upon. These two days received the name of Stations; a term borrowed from the *stationes* of the Roman soldiers, in accordance with the views held by the ascetics and monks that they were the warriors of Christ. At a synod in Spain in the beginning of the 4th c., the Saturday was superadded, but this innovation met with great opposition, especially in the East, where Jewish notions regarding the Sabbath had obtained a more permanent recognition. 2. Vigils, originally night-services observed by the first Christians on the eve of Sundays and festivals, partly in imitation of the Jewish custom of celebrating the entrance of the sabbath and of festivals on the evening of the previous day, and partly in fear of the danger to which a service in the daytime would have exposed the early converts. Although these night-services became unnecessary in the course of time, they were still continued till the 4th c., when owing to the abuses to which they led, they were abolished, or rather transformed into fast-days kept on the eve of great festivals in honor of Christ, Mary, Saints, and Apostles. 3. The great or 40 days' fast (Quadragesimal fast), most important and most rigorously enforced of all. The 40 hours of fast, in commemoration of the 40 hours during which Christ's body lay in the tomb, gradually expanded to 36, or rather 40 days, in pious allusion to the 40 days of Moses, Elijah, Christ, the 40 years' sojourn in the desert, or the 40 camps—all considered typical; and the fasting became severer the nearer the crucifixon week itself approached, in which many other signs of mourning and contrition were generally exhibited. 4. The Quatember fasts on the Wednesdays, Fridays, and Saturdays in one week of each season, in imitation of the four Jewish fasts in the 4th, 5th, 7th, and 10th months.—There were many other fasts, such as those of ordination, etc., but of only temporary existence. Without detailing the various dispensations granted by the church or the special pastoral letters generally issued before Quadragesima, or the variations in the observance of fasts and fasting in our own days, we note only, that fasts have in a great measure lost their former severity, and that only partial abstinence is the rule in all cases. The opinion held by the Rom. Cath. Church, and some other Christians, in former days, that fasting is meritorious, and conducive to the salvation of the soul, has undergone no change.

In the Greek Church, fasting was and is kept with much greater severity, the non-observance of it being the least venial of sins. The fast-days extend over almost three-quarters of the year. The principal ones are the Wednesday and Friday—with a few exceptions—throughout the year; the great Easter fast, lasting 48 days; that of Christmas, 39 days; that in honor of the Virgin, 14 days; and that of the Apostles, beginning on Monday after Trinity, and extending to June 29. Besides those smaller fasts of preparation, which correspond to the vigils of the Roman Church, they have many more occasional fasts.

The Church of England considers fasting a praiseworthy,

but not obligatory custom. According to Hook's *Church Dictionary*, the distinction between the Prot. and the Rom. Cath. view of fasting consists in this, that the Rom. Cath. regards the use of fasting as an imperative means of grace, the Prot. as only a useful exercise preparatory for the means of grace. In proof how much the Church of England has left the question of fasting to the conscience and discretion of her members, it may be observed that she has neither defined the mode or degree of fasting, nor anywhere given a positive command to fast. It has been remarked that no bishop of the Church of England has in an episcopal charge laid down fasting as a positive requirement. The days named by the English Church as seasons of fasting or abstinence, are the 40 days of Lent (q.v.), including Ash Wednesday and Good Friday; the Ember (q.v.) days; the three Rogation (q.v.) days; and all the Fridays in the year (except Christmas Day); and the eves or vigils of certain festivals.

The Scottish almanacs contain lists of the *fast-days* of all the principal places in Scotland. These are generally one in each year, appointed by the kirk-session of the Established Church (Presb.) of the parish, or by concurrence of kirk-sessions in towns, but generally by use and wont fixed as to their date. The fast-day is always some day of the week preceding the *Communion Sunday*, or Sunday set apart in Presb. churches for the dispensation of the Lord's Supper. It is usually appointed as a day for 'fasting, humiliation, and prayer.' Business is generally suspended, shops shut as on a Sunday, and churches opened for public worship. By an act of parliament not many years since, factories are prohibited from carrying on work on the parish fast-day, but in consequence of the ecclesiastical divisions in Scotland, it has become more common than it was for agricultural and other kinds of work to be carried on. The fast-day of a large town is always a busy day on the railways, many taking advantage of it for excursions, and making in a day of amusement; too many, also, a day of dissipation and revelry. That it is right to keep up the fast-day in these circumstances is doubted by many who themselves conform to its religious observance, though of that observance *fasting* does not now generally form a part. Many, however, doubt if it ever was a good institution; alleging that it is inconsistent with the frequent celebration of the Lord's Supper, which they deem right and desirable, and to which there is a growing tendency. The Scottish Reformers, as appears from the *First Book of Discipline*, contemplated the ordinary celebration of the Lord's Supper at least once a month; and the fast-day, as it now exists in Scotland, derives its origin from a later period.

In the United States, the churches observe fasts according to their various rules, or by special appointment. Some of the older states, especially in New England, have from the beginning had the custom of an annual fast-day designated by the governor, whose observance of late years tends to be remote from religious. The president has on rare occasions of special national crisis appointed fast-days.

which have had general observance. It is recognized, however, that all such appointments by the civil power have no force beyond that of pious recommendation and invitation.

A few words remain to be said of the Mohammedan fasts. Islam, as a development from Judaism and Christianity, adopted this custom with many others from both churches. During the whole month of Ramadan, in which the Prophet is fabled to have brought the Koran from heaven, eating, drinking, smoking, smelling perfumes, etc., are strictly forbidden from daybreak till sunset; for the intervening nights, however, all these restrictions are removed. There are, besides, many voluntary fasts, expiatory like the 10th of Moharram, corresponding to the Jewish Day of Atonement, or for the averting of the divine wrath in sudden calamities, or as an indemnification for the omission of certain pious acts, as the pilgrimage, etc. See JEWS: MOHAMMEDANISM: MONKS.

Besides the *Bible, Schulchan Aruch, Koran,* and the Fathers generally, see the following authorities on this subject: Bingham, *Orig.* IX., 1, 21; Fabricius, *Bibliogr. Antiquaria,* c. 11; J. A. Muratori, *De Quatuor Temporum Jejuniis,* etc.; J. Dallœus, *De Jejuniis et Quadragesima,* 1654; Schöne's *Geschichtsforschungen,* Th. 1; *Briefe über d. Gottesd. d. morgenl. Kirche,* von Dr. E. v. Muralt (Leip. 1838); Siegel, *Altchristl. Alterthümer;* Dassel, *De Jure Tempor. Quadrages.,* 1617; Walch, *De Jejunio Quadragesimali* (Jenæ 1727); Homborg, *De Quadragesima Veterum Christianorum et ritibus in ea quondam usitatis diss. qua etiam de recentior. Papist., Græc., Russ., Syrian., Georgian., Maronit., Jacobit., etc., disseritur* (Helmst. 1677).

Fasting, or deprivation of food, is, in a physiological sense, inconsistent with the continuance of life in most warm-blooded animals more than a few weeks. If water is not supplied, the period is much shorter, being in man commonly not more than a very few days, or at most a week. Persons have been found in coal-pits and mines, and in other situations where access to food has been impossible, but where water could be had, as long as six weeks after their seclusion, still alive, though very feeble; and a very small daily allowance of food has supported life longer than this, as in some cases of shipwreck, and other accidents at sea. Cases of alleged fasting, longer than this, as in the notorious woman of Tutbury, England, are certainly in most instances impostures. The insane appear sometimes to bear fasting better than the healthy. Hibernating animals (see HIBERNATION) are capable of sustaining the want of food for an apparently indefinite period of weeks during the winter sleep; but no warm-blooded animal can endure fasting in anything like the same degree as the reptiles, in many of which, indeed, the natural state of existence is one of long intervals between the times of taking food, and in which the vital change of texture is remarkably slow. Thus, the remarkable amphibious animal, the *Proteus anguinus,* has been known to live for years without food, and the same is true of salamanders,

tortoises, and even goldfishes. In fasting, the body gradually emaciates, most of the secretions are arrested, or greatly diminished, and at last the animal heat falls rapidly in all parts of the body. In attempting the recovery of persons reduced by fasting, food must be given in very small quantities at a time, and of the most nourishing and digestible quality; stimulants should be either withheld, or very cautiously administered. The most important point, next to the regulation of the food, and sometimes even before food is given at all, is the removal of the torpor and chill of the body by gradually applied heat, with friction of the limbs. See Tiedemann's *Physiology;* Burdach's *Physiology;* Chossat, *Recherches sur l'Inanition.*

FAST AND LOOSE: a cheating game, called also *Pricking at the Belt,* or *Prick the Garter*, which appears to have been much practiced by the gypsies in the time of Shakspeare. The following is a description: 'A leathern belt is made up into a number of intricate folds, and placed edgewise upon a board or table. One of the folds is made to resemble the middle of a girdle, so that whoever shall thrust a skewer into it would think he held it fast to the board; whereas, when he has so done, the person with whom he plays may take hold of both ends, and draw it away.'

FASTEN, FASTNESS: see under FAST 1.

FAS'TEN'S EVE: see SHROVETIDE.

FASTI, *făs'tī* [L., pl. of *fastus,* according to divine law; from *fas,* divine law]: applied to things that are according to divine law. Hence the *dies fasti,* or lawful days, among the Romans, were the days on which it was lawful to transact business before the prætor. But the sacred books in which the lawful days of the year were marked, were themselves denominated *fasti,* and the term was employed, in an extended sense, to signify various kinds of registers, which have been often confounded with each other. These registers fall into two principal divisions—the Fasti Sacri or Kalendares, and the Fasti Annales or Historici.

1. *Fasti Kalendares,* or calendars of the year, were kept exclusively by the priests for about four centuries and a half after the building of the city. The appearance of the new moon was proclaimed by a pontifex, who at the same time announced to the people the time which would intervene between the Kalends and Nones: see CALENDS: CALENDAR. On the Nones, the country-people assembled for the purpose of learning from the Rex Sacrorum the various festivals of the month, and the days on which they would fall. In the same way, those who intended to go to law, learned on what days it would be right (*fas*) to do so. The mystery with which this lore was surrounded, for purposes of power and profit, by the favored class, was dispelled by Cn. Flavius, the scribe of Appius Cæcus, who surreptitiously copied from the pontifical book the requisite information, and published it to the people in the forum. From this, time-tables (*fasti*) became common, much resembling modern almanacs. They contained the days and months

of the year, the Nones, Ides, lawful and unlawful days, etc.: astronomical observations on the rising and setting of the fixed stars, the commencement of the seasons, brief notices concerning the introduction and signification of certain rites, the dedication of temples, the dates of victories, disasters, and the like. In later times, the exploits and honors of the imperial family were duly entered in the calendar. The celebrated *Fasti* of Ovid is a sort of poetical companion to the calendar, as published by Julius Cæsar, who remodelled the Roman year.

Several very curious specimens of fasti on stone and marble have been discovered, of which one of the most remarkable is the Kalendarium Prænestinum, which stood in the lower part of the forum of Præneste, described by Suetonius. Of these ancient fasti, 11 are enumerated by Feggini, learned Italian antiquary. One of the most interesting is a rural almanac, known as the Kalendarium Rusticum Farnesianum, cut on four sides of a cube, each side of which is divided into three columns, each column embracing a month. The various agricultural operations to be performed in each month are given on this curious relic, in addition to the ordinary information contained in these calendars. In the month of May, for example, the rustic is told that his corn must be weeded, his sheep shorn, his wool washed, etc.

2. *Fasti Annales or Historici,* were chronicles, containing the names of the consuls and other magistrates of the year, and an enumeration of the most remarkable events in the history of Rome, noted opposite the days on which they occurred. From its application to these chronicles, the word fasti came to be used by the poets as synonymous with historical records. A very interesting specimen of fasti of this class was discovered in the forum at Rome 1547. The fragments into which it had been broken were collected and arranged by Cardinal Alexander Farnese, and placed in the Capitol, where they may still be seen.

FASTIDIOUS, a. *făs-tĭd′ĭ-ŭs* [L. *fastidĭōsŭs,* disdainful, fastidious—from *fastidĭŭm,* aversion: It. *fastidioso:* F. *fastidieux*]: difficult to please; over-nice. FASTID′IOUSLY, ad. *-lĭ.* FASTID′IOUSNESS, n. squeamishness of mind or taste.—SYN. of 'fastidious': squeamish; over-critical; punctilious; particular; difficult; disdainful; over-delicate.

FASTIGIATE, a. *făs-tĭj′ĭ-āt,* or FASTIG′IATED, a. *-ā-tĕd* [L. *fastigĭŭm,* that which is made pointed, the highest point: It. *fastigio*]: in *bot.*, having a pyramidal or sheaf-like form, from the branches being erect and close to the stem, as in the poplar-tree.

FASTIGIUM, n. *făs-tĭj′ĭ-ŭm* [L.]: pediment of a portico, so called because it follows the form of the roof; the comb or ridge of a roof.

FASTNET LIGHT: light-house, on a rock off the Irish coast, 3½ m. s.w. of Cape Clear (q.v.); with a revolving light 148 ft. above high water, visible 18 miles.

FAT, a. *făt* [Ger. *fett;* Icel. *feitr;* Dut. *vet,* fat]: stout; opposite of lean; plump; rich; fertile; N. a solid oily substance white or yellow, found in animals; the best part; in *Scrip.*, for VAT: V. to grow fat or full-fleshed; to make fat. FAT'LY, ad. *-lĭ.* FATS, oily substances solid at ordinary temperatures and not differing essentially from the liquid oils (see OILS). ANIMAL FATS: see FATS, ANIMAL. FAT'NESS, n. quality of being fat or plump. FAT'TISH, a. *-tĭsh,* somewhat fat. FAT'TY, a. *-tĭ,* containing fat; having the qualities of fat; caused by fat; greasy. FAT'TINESS, n. *-nĕs.* FAT'LING, n. a lamb or kid, or suchlike, fattened for slaughter. FAT'TED, a. made fat. FATTEN, v. *făt'n,* to make fat; to make stout or plump; to enrich; to grow plump or fleshy. FATTENING, imp. *făt'nĭng:* N. the process of making fat; the state of becoming fat. FATTENED, pp. *făt'nd:* ADJ. made fat or plump. FATTENER, n. *făt'nĕr.* FAT-HEN, n. in *bot.*, name applied to various plants, especially to certain *Chenopodiaceæ,* having thick, succulent foliage. FAT-VESICLES, n. in *phys.*, the vesicles in the bodies of men and the inferior animals in which fat is deposited, often in the interstices between organs. FATTY ACIDS, a series of organic acids, some of which are combined with glycerine to form fat (see OILS). FAT LUTE, composition of linseed oil and pipe-clay (see LUTE). FATTY-INFILTRATION, n. in *anat.*, an infiltration of the tissues with fat deposited in them from the blood. It is only a deposit, and is therefore not synonymous with fatty degeneration, which is the abnormal deposition of free fatty matter in the elements of animal bodies. FATTY-KIDNEY, n. in *med.*, name for Bright's disease of the kidney.

FAT, n. *făt:* OE. for VAT.

FATA MORGANA, *fā'tă mŏr-gā'nă* [It. the fairy *Morgana*—from It. *fata,* a fairy; Bret; *mor,* sea; *gana,* fine lady]: striking kind of mirage at sea, observed especially in the Strait of Messina. A spectator on the shore sees images of men, houses, ships, etc., sometimes in the water, sometimes in the air, the same object having frequently two images, one inverted: see MIRAGE.

FATAL, a. *fā'tăl* [F. *fatal*—from L. *fatālis,* of or pertaining to fate, decreed—from *fātŭm,* a prediction, fate: It. *fatale*]: deadly; mortal; causing death or destruction; inevitable; necessary; calamitous. FA'TALLY, ad. *-lĭ,* in a fatal manner; mortally. FATALITY, n. *fă-tăl'ĭ-tĭ* [F. *fatalité*]: tendency to danger or disaster; inevitable necessity; mortality. FATALISM, n. *fā'tăl-izm,* the doctrine of an inevitable necessity overruling all things. FA'TALIST, n. one who maintains that all things happen by inevitable necessity. FA'TALIS'TIC, a. *-tĭk,* implying fatalism: see FATE.

FATE, n. *fāt* [OF. *fat,* fate—from L. *fātŭm,* what is spoken, destiny: It. *fato* (see FATAL)]: inevitable necessity; event predetermined; lot; destiny; death; destruction. FATED, a. *fā'tĕd,* doomed; invested with any power or quality by fate; decreed by fate. FATES, n. plu. *fāts,* in

anc. myth., the three goddesses or destinies supposed to preside over the life and death of every individual—named respectively Clotho, Lachesis, and Atropos (see PARCÆ).—SYN. of 'fate': doom; fortune; chance.

FATE—FATALISM: the doctrine that all events in the life of men are absolutely fixed by the decrees of God, or by the operations of nature, so that man has no power to alter them. As a vague conception, it has had more or less place in all religions. The words are derived from the Latin *Fatum*, which has primarily a passive signification, denoting something uttered—a supreme decree or ordinance. The Greeks expressed the same thought by *Eimarmenē*. *Moîra*, was the name given to the active personification of the idea—the goddess Fate or Destiny. It represented, in Greek mythology, the final monotheistic element—the vague Unity binding together and dominating over the crowd of Olympian deities. In Homer, *Moîra* has a double meaning, appearing sometimes as superior to the will of Zeus, and sometimes as inferior to this will. With the course of Grecian thought, the conception of Fate became more spiritualized. In Æschylus it is an inexorable Destiny; in Sophocles and Plato, it is more of a free and ordering Will. In the latter forms of Greco-Roman speculation, it undergoes various modifications. With the Epicureans, it seems identical with Chance (*Tuchē*); with the Stoics, it is the very opposite of this. In the one case, the Absolute is a mere blind fatality; in the other case, it is an imminent necessity of reason, governing with iron sway the apparently accidental phenomena of life.

In modern times, the extreme example of fatalism is found in Mohammedanism, where everything that can happen is 'kismet,' i.e. determined by fate. Christianity has always opposed fatalism on moral grounds, since one of its most fundamental tenets, especially in modern times, has been the personal responsibility of the individual for his own actions. The upholders of the doctrine of predestination, such as Augustine and Calvin, have frequently been accused by their opponents of fatalism, but have always vehemently denied the charge. Among philosophers, the defenders of determinism, such as Spinoza, and Herbert Spencer, have been called fatalists, but probably with injustice. Certainly the influence of Calvinism and the teachings of Spinoza and Spencer, to say the least, have had an effect diametrically opposed to fatalism, since they have tended to fortify the individual, and make him extremely self-assertive of his own rights, and often arrogantly confident of the value of his own freedom of initiative.

The tendency toward fatalism in philosophy and theology is due to the inherent desire of human thought to view the universe as a unity, complete and harmonious, and this seems to demand the complete determination of parts by the whole, and particular events by the absolute will of God. On the other hand, the opposing ethical

consideration, that if there are to be such notions as right and wrong and moral responsibility, the individual must be free to exert some choice in his actions, has so powerfully militated against fatalism that the expression is now usually a term of reproach.

FATEHGANJ: see FUTCHGUNGE.

FATEHGARH: see FUTTYGURH.

FATEHPUR: see FUTTEHPUR.

FATES: in ancient mythology, the three inexorable sisters, Clotho, Atropos, and Lachesis, who spin the thread of human life. Clotho means she who spins (the thread of life); Lachesis, the disposer of lots; Atropos, unalterable fate. The first spins the thread, the second determines its length, and the third cuts it. In the narrowest signification they are the goddesses of death. In this capacity they belong to the infernal world, and are daughters of Erebus and Night. As goddesses of fate they are the servants of Zeus and the offspring of Zeus and Themis. As daughters of Zeus, they have a share in the decisions of fate, and are commissioned by him to execute his commands.

FATHER, n. *fâ-thėr* [AS. *faeder;* Icel. *fathir;* Goth. *fadar;* Gr. and L. *pater;* Ger. *vater,* father]: a male parent; the first ancestor (see PARENT AND CHILD: FAMILY: PATRIA POTESTAS); a common title, applied to a protector, deliverer, or supporter; God the Creator; a familiar term for an old man; any man reverend for age, learning, or piety; a name given to Rom. Cath. priests; the first originator: V. to ascribe or charge to one as his offspring or production; to adopt anything as one's own. FA′THERING, imp. adopting as one's own; ascribing to any one as the father. FA′THERED, pp. *-thėrd.* FA′THERLAND, n. one's native land. FATHER-IN-LAW, n. the father of one's husband or wife. FA′THERLESS, a. without a father. FA′THERHOOD, n. the character or authority of a father. FA′THERLY, a. *-lĭ,* paternal; like a father: AD. in the manner of a father. FA′THERLINESS, n. parental kindness and care. FATHER-LONGLEGS, n. common name for the crane-fly; called also daddy-longlegs. THE FATHER, the first person of the Holy Trinity (see TRINITY, DOCTRINE OF THE). THE FATHERS, the early Christian writers till the seventh —some say thirteenth—c.

FATHER-LASHER, *fâ′thėr-lăsh′ėr* (*Cottus bubalis*): very common fish on the British coasts, the most spiny of the British species of *Cottus* (q.v.), and armed with strong spines particularly on the back of the head—which is large —and on the gill-covers. When touched, it distends its gill-covers, sets out its spines, and assumes a very threatening appearance. Its general aspect is indeed forbidding, and boys who angle from the rocks and pier-heads are usually averse to touch it, though it is said to be wholesome and agreeable food. It is of a brown color above, whitish beneath, curiously marbled and spotted, the fins marbled black and white. American species are known as sculpins, sea-robins, sea-toads, etc.

FATHERS OF THE CHURCH (*Patres Ecclesiastici*): certain early writers of the Christian Church. The term Abba, Greeized ἄββας (Father), in use among the Talmudists as a synonym of Rabbi (my master), and constituting, according to Maimonides, the third or lowest honorary title of a Doctor of the Divine Law, was in the first centuries of Christianity applied indiscriminately to all theological writers distinguished by learning, genius, or piety. Gradually, however, the word Father, or, more fully, Father of the Church, was confined to those teachers whose writings were considered pre-eminently orthodox, and who might be looked upon as the *progenitors*, as it were, of certain dogmas, upon the development of which they had exercised a more or less direct influence; while those writers who diverged into the fields of heretical opinion were called simply *Scriptores Ecclesiastici* (Church-writers). Out of the number of the former, some few master-minds, to whom the church owed a still greater tribute, were again singled out as *Doctores Ecclesiæ* (Doctors of the Church), which title of pre-eminence, however, is bestowed on many writers who lived subsequently to the time of the Fathers, in consideration of their 'purer and more excellent doctrine' (Benedict, xiv., *Bulla, Milit. Eccles.*).

The temporal limits within which the Fathers are to be confined, as well as their proper share of authority in matters of faith, have long been points of grave discussion. While some include the Fathers of the 1st. c., generally called the Apostolical Fathers, on account of their being the contemporaries or disciples of Christ and the apostles, they are excluded by others; again, by some, the 7th c. is made the closing period, while others carry the list down to the 12th, or even the 13th century.

With respect to the authority of the Fathers, some, like Fredegis, held their words as sacred as those of the prophets and New Testament writers; while others, like Alphonso di Castro, Melelius Cano, and Cardinal Cajetan, ridiculed the notion that Symmachus should be made equal to St. Paul, or Didymus to St. John the Evangelist. Others like Pope Gregory and the majority of writers, took the middle course of regarding them not as infallible, much less as prophets and apostles, but held, that when in matters of faith the most perfect and unswerving unanimity reigns among them, then only, the Holy Ghost is to be considered to speak through them. See RULE OF FAITH: INFALLIBILITY.

Immense as is the range and variety of their writings, ascetic, apologetic, polemical, exegetical, moral, historical, or dogmatical, so also is the diversity of their individual value. Nothing can be further from historical justice than either the wholesale laudation or condemnation of these writers as a body; but whatever stand we may take, we cannot but see that their writings are of great moment either as instruction or as history. Stretching over the entire extent of that period which forms the turning-point between the antique and modern world, they faithfully and often unconsciously portray that awful change, of which they were

in no small degree the instruments—the gradual wane of old faiths, and of an old civilization, and the slow and struggling rise of that which was to replace them; while they preserve the most minute and trifling details with the same accuracy as the most momentous event, as each happened to bear upon their subject. The philosopher, the historian, the antiquary, each and all will find their writings, as a whole, an inexhaustible fund. Of no less interest, perhaps, are their works in relation to the writers individually. These, issuing from all parts of the then known world, from all ranks, all creeds, could not but impress the stamp of their nationality and callings, besides that of their youth or age, vigor or feebleness, upon their writing—Jew, Greek, Roman, African, Spaniard—orator, poet, lawyer, statesman, priest, they all bring with them that which was their own before they embraced the new faith: their dialectic power, their fantastic poetry, their graceful speech, their stern austerity. What Greek subtlety did theoretically for the development of dogma in Origen and Athanasius, that also Roman thoroughness did practically for the erection of the hierarchy in Leo the Great and Gregory III.; and while from Egypt came asceticism and monachism, the ascendency of spiritualism over sensualism is owing to those who came from the n. coast of Africa. To some extent, Platonism, especially neo-Platonism, Aristotle, and Greek philosophy generally, are found developed in these works, and infused into the new faith by the former teachers of the academies themselves, who mostly retained their old philosophical garb.

The following is a brief survey of these writers: for the more eminent among them, see the respective titles. According to the now generally adopted method of dating them from the 1st to the 7th c., they are divided into two distinct periods, the first of which extends to the Council of Nicæa, 325. Of those who head the list, the Apostolic Fathers—so called from their supposed connection with Christ and the apostles—very little need be said, as their writings, mostly of an ascetic character, have come down to us in a corrupt and mutilated state, and as the writers themselves owe their chief celebrity to the times in which they lived. We have here Barnabas, the son of Teostes, and the companion of the apostle Paul (Acts ix. 27; xii. 25); Clement, supposed to have been third Bp. of Rome, and the Clement mentioned by Paul (Phil. iv. 3); Hermas, identical perhaps with the Hermas of Paul's Epistle to the Romans (xvi. 14); Ignatius, Bp. of Antioch; Polycarp, Bp. of Smyrna; Papias; Dionysius the Areopagite, etc. Next follow the Apologists, or those Fathers whose chief aim was the defense of the new faith against the Roman state, and non-Christian authors; and who were the first to make their scientific culture, and especially the Platonic philosophy, subservient to Christianity, for this purpose: Quadratus the 'Evangelist,' travelling missionary; Aristides, philosopher; Justin Martyr, well-known author of the two Apologies and the Dialogue with Trypho (or rather Tarphon); Tatian of Assyria, who, having examined the differ-

ent forms of worship, as well as the systems of philosophy prevalent in his time, felt satisfied with none but Christianity, and became a disciple of Justin, and a vindicator of the philosophy of the 'barbarians;' Athenagoras, who addressed his Apology to the Emperor Marcus Aurelius and his son Commodus, and wrote a Defense of the Doctrine of the Resurrection; Theophilus, Bp. of Antioch; Miltiades, etc. Next come the Church Fathers of Asia Minor, men of more practical and peaceful tendencies: Hegesippus, perhaps an Ebionite; Irenæus, Bp. of Lyon and Vienne, who wrote a refutation of the Gnostic system; Hippolytus, his disciple, of unknown birthplace and renowned name. In the N. African Church, the development of which is of the utmost moment, inasmuch as its language, dogmas, and laws were adopted by the greater part of the Christian world in the West, we find Tertullian of Carthage, rhetorician and advocate, a man of profound mind and vast influence; Cyprian, author of the *Testimonies* in favor of Christ; Commodian, writer of the *Rules of Living;* and Arnobius, rhetorician of Sicca, in Numidia. The first comparatively barren, though otherwise highly important church, is the Roman. The pre-eminently practical Roman mind looked more to the outward growth and well-being of the church than to literary excellence, and thus we have only two distinguished authors to be noticed here—the Presbyter Caius, known as an opponent of the Montanists; and the Presbyter Novatian, who wrote a treatise on the Jewish laws respecting food. The church which, more than any other, endeavored to combine speculation with faith, and which gradually became, through its high degree of culture and erudition, the very centre of Christianity, is the Alexandrian. And here we have Pantænus; Clement the Alexandrine, known chiefly by his Stromata or Elements of the Gnosis; Origen, called Adamantinus, eminent Neo-Platonist, born 185 in Alexandria, one of the most influential writers of the whole Christian Church; Herculas, with his disciple Dionysius, a liberal aud moderate man; Gregory, worker of miracles; Pamphilus, and Julius Africanus, first Christian chorographer.

In the second period, which dates from the Nicæan Council, and comes down to Gregory II., 604., period altogether superior, on account of the great number of intellectual and erudite men who devoted their lives and labors to the church, we have to distinguish the Greek from the Latin Fathers. Among the Greek, we have again to draw a line between those of the Alexandrine school on one hand--like Eusebius Pamphili, the Herodotus of the church; Athanasius, father of orthodoxy; Basil the Great, Doctor Ecclesiæ, and his brother Gregory of Nyssa; Gregory of Nazianzen, called the Theologian, by war of eminence; Didymus; and Cyrillus, some time Patriarch of Alexandria, chief prosecutor of Nestorius--and on the other hand those of the Antiochian school, where we find Ephraem Syrus, 'the prophet of the Syrians;' Cyril of Jerusalem, the converted Arian; John Chrysostom, of brilliant eloquence; Diodorus, B of Tarsus, one of the chief founders of the

Antiochian school; and Theodoretus, Bp. of Cyrus. Besides these, we find, of Greek Fathers who belonged to neither school—Epiphanius, violent adversary of Origen; Socrates Scholasticus, continuator of Eusebius's *Ecclesiastical History;* Philostorgius, Arian Church historian; Logomenus; Evagrius; Macarius the Elder, known chiefly through his miracles and combats with the devil; Procopius of Gaza, rhetorician; and Joannes Scholasticus, famous through his collections of canonical law. Among the Latins, we have to enumerate first the African Fathers: Fabius Victorinus; Augustine of Tagaste in Numidia, greatest dogmatist of the Western Church; Pope Gelasius I. (492—496), who finally fixed the canon of the Bible for the Rom. Church; and the Bishops Fulgentius, Junilius, and Facundus. Of Spaniards, we have Prudentius, poet; Paulus Orosius, whom Augustine used as his messenger to the East in his controversies with Pelagius. Of Gauls there are Hilarius Pictaviensis, Bp. of Poitiers about 350, the Athanasius of the West; Paulinus of Nola; Sulpitius Severus, friend of Martin of Tours; Vincent of Lerins, once a soldier, who wrote under the name of Peregrinus; Sidonius Apollinaris, Bp. of Clermont; Gennadius, author of an ecclesiastical literary history; Ennodius from Arles, who exerted himself to unite the Eastern and the Western Church; and Gregorius Turonensis, who wrote *Historia Ecclesiastica Francoum*, the basis of Frankish history. From other countries we have Sedulius, an Irishman; Joannes Cassianus, a Scythian; and Mercator, of unknown birthplace. We conclude with the Italians themselves: Lactantius Firmianus, the Christian Cicero; Julius Firnisius Maternus of Sicily; Ambrose, Metropolite of Milan, who raised his see to such a power that it dared to resist Rome herself till the 12th c; Rufinus of Aquileia, defender of Origen against the charge of heresy brought against him in the West; Eusebius Hieronymus, undoubtedly most learned of all the Latin Fathers, and who mastered also the Greek and Hebrew languages, collected in Palestine the most valuable notes for the elucidation of the Scriptures, and also corrected the Latin edition of the Vulgate; Pope Leo I.; Boëthius; Aurelius Cassiodorus, whose *Historia Tripartita*, in 12 books, served for a thousand years as a compendium of ecclesiastical history; the two poets, Arator and Venantius Fortunatus; and Pope Gregory I. (550–604), regarded by Protestants as having first given the Western Church its peculiarly Rom. Cath. stamp by developing the idea of the Eucharist into a Theophany, and making it the centre of the worship. His works, especially his letters, are invaluable for the study of his own times, especially for the history of the conversion of the West.

On the MSS. of the Fathers, see *Petri Lambeccii Commentarii de Bibliotheca Cæsarea Vindobonensi.* The editors of the works of the Fathers are of two classes—those of the individual Fathers whose writings are the most voluminous and of highest dogmatical importance, and the general Patristic collections which comprise the writings of the less voluminous or minor Fathers. In the former class, the first place, beyond all dispute, belongs to the celebrated Benedic-

tine editions, by the members of the great Maurist congregation of the French Benedictine order (see BENEDICTINES), of which community the task of editing the Fathers came to be considered as the recognized work. The Benedictine editions of the greater Fathers, with the exception of two or three, still maintain the very highest place in the estimation of the learned. Of the collections of the works of the Fathers, the most important are those of La Bigne, Galland, Rössler, Walch, Zimmerman, and Migne. Reference may be made also to Cardinal Mai's *Bibliotheca Patrum, Spicilegium Romanum,* and *Classici Auctores,* and to the *Spicilegium Solesmense* of the Benedictines of Solesme. Translations of the principal Fathers are numerous. For the chief works on the more important Fathers, see their several titles.

FATHER TOM: see BURKE, THOMAS NICHOLAS.

FATHIPOOR: see FUTTEHPUR.

FATHOM, n. *făth'ŭm* [AS. *fæthm,* a bosom, an embrace: Icel. *fadma;* Dan. *fadme,* to embrace: Icel. *fadmr,* a bosom, a fathom]: the distance between the extremities of the arms extended; a measure of length of six ft., used chiefly in reference to marine soundings and in mines; in *OE.,* reach; penetration; depth; V. to reach; to master; to comprehend; to try the depth and to find it. FATH'OMING, imp. FATH'OMED, pp. *-ŭmd.* FATHOMER, n. one who fathoms, penetrates into, or comprehends. FATH'OMABLE, a. *-ŭm-ă-bl,* able to be measured in depth, etc. FATH'OMLESS, a. bottomless; that cannot be penetrated or comprehended. FATHOM-WOOD, n. in *naut.,* slabs and other offal or waste of timber sold at the yards by fathom lots, cubic measurement.

FATIGATE, v. *făt'ĭ-gāt* [L. *fatigātus,* wearied, fatigued]: in *OE.,* to exhaust with labor; to fatigue; ADJ. in *OE.,* worn out by labor; fatigued. FAT'IGATING, imp. FAT'IGATED, pp.

FATIGUE, n. *fā-tēg'* [F. *fatigue*—from L. *fatigārĕ,* to weary or tire]: weariness; exhaustion of strength from mental or bodily labor; lassitude; toil; labor: V. to tire or weary; to exhaust with labor. FATIG'UING, imp. ADJ. inducing weariness. FATIGUED', pp. *-tēgd':* ADJ. wearied; harassed. FATIGUE DUTY, the labors in which soldiers are often engaged distinct from the use of arms. FATIGUE-DRESS, the dress worn by soldiers in doing rough or laboring work. FATIGUE-PARTY, a number of soldiers on fatigue-duty.

FATIGUE. The value of fatigue in the economy of an organism is to guard against over-excitation and to prevent exhaustion. In muscular fatigue e.g. sensations of pain in the muscle or loss of irritability bring the functioning member to a state of rest before exhaustion of the nerve centres sets in.

From the physiological standpoint the chief characteristic of fatigue is a decrease of irritability of living sub-

stance, but in common usage it is a decrease in physical or mental efficiency resulting from exertion and accompanied with more or less unpleasant feeling.

Fatigue of Muscles and Nerves.—Physiologically muscular and nervous fatigue have been investigated by stimulating muscular contractions against the pull of a weight either in the living animal or in the dissected out 'muscle-nerve preparation.' Physiological and psychological are the researches where fatigue has been induced by work on the dynamometer—usually an elliptical steel-spring with an index for registering the amount of pull or compression,—or by the far more satisfactory Mosso's ergograph. In the latter instrument fatigue is brought on by rhythmic contraction of the muscles, usually of the middle finger acting against the pull of a weight, while the apparatus registers graphically the duration and amount of work done by the several contractions. The object of many of the numerous investigations on nervous and muscular fatigue has been to ascertain if the loss of efficiency was due to the condition of the muscle, the terminal plates of the nerve in the muscle, to the nerve trunk, or to the cell body of the nerve.

The initial decrease in the contracting power of an over-exercised muscle results from the decomposition products in the substance of the muscle itself. These products are sluiced out by the blood circulation and the muscle soon recovers tone with rest. But the fatigue of long-continued exertion results in the greater or less exhaustion of assimilable material, especially in the ganglion cells of the nervous system, the nuclei of which shrink and lose their rounded form. This form of fatigue passes off only with long rest, usually with sleep. The nerve trunk itself appears to be unfatigueable.

Mental Fatigue.—Mental fatigue is conditioned on nervous fatigue, but is investigated apart from the latter. It is measured by testing, before and after a period of fatiguing work, efficiency for simple intellectual exercises such as the primary arithmetical operations, or learning columns of figures or letters. The effects of fatigue in conjunction with the opposing tendencies of practice and periods of rest have been determined by noting the accuracy and amount of work done in successive segments of a long continued series of mental operations, simple enough to be capable of analysis. The problem is one of much practical interest in connection with the distribution of work in the school. The progress of fatigue in mental work is obscured by the action of practice, of habituation, which essentially, is the economic adaptation of attention, and by impulsive effort. And as is the case in physical exercise, a period of rest for recovery from fatigue may be at the expense of the 'incitation' or momentum. In general the marks of mental fatigue, are weakening of attention, and of the capacity for reproduction of ideas. Consult A. Mosso's *Fatigue* translated from the Italian *La Fatica*, a popular but able

treatment of the several aspects of the subject; M. E. Holmes, *The Fatigue of a School Hour* (*Pedagogical Seminary*, 3, 1895); and Ebbinghaus *Ueber eine neue Methode zur Pruefung geistiger Faehigkeiten und ihre Anwendung bei Schulkindern* (*Zeitschrift fuer Psychologie*, 13, 401), which contains review and criticism on work done on school fatigue.

FATIMIDES, *făt'ĭ-mīdz*, or FAT'IMITES, *-ĭ-mīts:* Arabian dynasty which reigned for nearly two centuries over Egypt. Its founder was Mahadi-Obaidallah, A.D. 910-934. He asserted that he was descended from Fatima, daughter of the Prophet, and Ismael, a grandson of Ali. He thus won over to his side all the adherents of the widely diffused Ismaelites, an extravagantly schismatic sect of Mohammedans in Africa, and overthrew the race of the Aghlabides, who ruled at Tunis. His successor extended his dominion as far as Fez, and his descendant, Moëzz, in 970, conquered Egypt, expelled the reigning family, removed his court thither, founded Cairo, assumed the title of Caliph, thus proclaiming himself the lawful successor of the Prophet, and subdued Syria and Palestine. After the death of Moëzz, the F. maintained their high position for some time; but gradually degenerated, and resigned all the cares of government into the hands of their viziers. Their power then rapidly declined, and their vast territories melted away. In religious matters, the F., because they were raised to power by the followers of Ali, took upon themselves the protection of the Shiite sect, and the establishment of the Ismaelitic doctrines. Between 1002-21, the Caliph Hakem-Biamr-Allah persecuted the orthodox Mohammedans or Sunnites, as well as Jews and Christians. He founded an academy at Cairo, and endowed it largely, but connected with it a great secret society for the diffusion of Ismaelitic opinions. In the first stages, the novice was shown the untenable nature of the precepts of the Koran; in the sixth, the advanced student found that religious legislation must give way to the claims of philosophy, in the seventh, a mystic pantheism was proved to be the true philosophy; and finally, in the ninth, the initiated discovered that he was not required to believe anything, and might do whatever he pleased. The system, with considerable modifications, found a home among that peculiar people the Druses (q.v.). After the death of Adhid, the last of the F., 1171, the founder of the dynasty of the Ayubides, Salâh-ed-dîn (Saladin), took possession of Egypt.

FATLING, FATNESS, FATTEN, FATTY, etc.: see FAT 1.

FATS: a class of compounds of analogous constitution, found abundantly and widely distributed throughout both the animal and plant kingdoms. They all possess more or less of an unctuous or greasy feel, and produce spots on paper which are permanent. Fat occurs in all organs and tissues of the animal organism, but in very varying proportions; the marrow contains the largest

quantity, about 96 per cent. The most important deposits of fat in the animal organism are: the intermuscular connective tissue, the fatty tissue in the Abdominal Cavity and the Subcutaneous connective tissues. Amongst the plants the seeds and fruits, and occasionally the roots, are rich in fat.

Fats are of various degrees of consistency, as illustrated in tallow, lard and oil. When perfectly pure, they are odorless and tasteless; they are lighter than water, and insoluble in that medium. They dissolve in boiling alcohol, but separate in cooling, often crystallizing; soluble in ether, benzene and chloroform. The fats consist almost entirely of the so-called neutral fats with only very small quantities of fatty acids. These neutral fats are ethereal salts (esters) of the triatomic alcohol, glycerin, with monobasic fatty acids. These salts or esters are triglycerides, that is, the three hydrogen atoms of the hydroxyl groups of the glycerin are replaced by acid radicals. The animal fats consist chiefly of esters of the three fatty acids, stearic, palmitic and oleic acids. In certain fats, especially in milk fat (and so in butter), glycerides of other acids, such as butyric, caproic, caphylic and capric, occur in considerable quantities. Other alcohols than glycerin are said to be found in some animal fats, but ordinarily only in very significant amounts.

The three important glycerides above mentioned, are commonly called Tristearin, Tripalmitin and Triolein, and their average elementary composition is: Carbon, 76.5 per cent., Hydrogen, 12 per cent., and Oxygen 11.5 per cent.

The origin of the fat in the animal body must undoubtedly be referred chiefly to the fat taken with the food. That the fat of the food which is absorbed in the intestinal canal may be retained by the tissues, has been shown in several ways; dogs have been fed on varous fats, such as linseed oil, mutton tallow, rape-seed oil, and these administered fats have been found subsequently in the tissues; again, dogs starved until they had lost all their fat, were fed upon large quantities of fats and only little proteids; when the animals were killed, so large a quantity of fat was found that it could not have been formed from the proteids alone, but the greater part must have been derived from the fat of the food. As to the formation of fat in the organism from other bodies, such as proteids and carbohydates, there has been much contention, and even now the question can hardly be considered settled. The formation of fat from carbohydrates was first suggested by Liebig. This was combatted for some time, and until lately it was the general opinion that a direct formation of fat from carbohydrates was not only not proved, but also improbable. Lately, however, it seems to have been positively demonstrated through a series of nutrition experiments with food specially rich in carbohydrates, that such formation can and does take place.

In regard to the formation of fat from proteids a similar difference of opinion exists. According to some experi-

menters, the animal body under normal conditions has not the power of forming fat from proteids; according to others, the formation of fat from proteids is positively proved.

Since carbohydrates, glycogen and sugar are generally admitted to be able to be formed from proteids, it cannot be denied that possibly an indirect formation of fat from proteids with a carbohydrate as an intermediate step, can take place. The possibility of the direct formation must also be generally admitted, although such formation has not been conclusively proved.

Fat, usually inclosed in vesicles, is found very extensively in the animal kingdom. It is abundant in many larvæ, and occurs more scantily in most insects. It is found in the mollusca, and is comparatively abundant in all the divisions of the vertebrata. In most fish, it occurs throughout the body, but is abundant especially in the liver, where it is found in the hepatic cells, and not in its own characteristic vesicles. In reptiles, it exists chiefly in the abdomen. In birds, we find it especially about the peritoneum, and under the skin. In mammals, it is very generally diffused. The quantity of fat in the human body varies considerably at different periods of life.

In solid fats—as tallow,—tristearin and tripalmitin are in excess, while the less solid fats are characterized by a greater abundance of tripalmitin and triolein. This last mentioned glyceride is found in greater quantities in cold blooded animals, and this accounts for the fat of these animals remaining fluid at temperatures at which the fat of warm blooded animals solidifies. Human fat contains from 70 to 80 per cent. triolein.

The decomposition of fats is an important operation; the splitting, as it is called, is affected by the addition of the elements of water; the result is the formation of glycerin and the fatty acids, and it is carried on in the organisms through the agency of enzymes (unorganized ferments); while outside the organism, it may be effected by superheated steam. Saponification, a process chemically equivalent to the above, is brought about by boiling the fat with alkaline or other bases whereby the glycerin and salts of the fatty acids are formed. If the alkali has been used, the salts are soaps; if lead oxide, the resulting salt is lead plaster.

Fats, on keeping for a long time in contact with air, undergo a change, become acid in reaction, and develop an unpleasant taste and smell. It becomes *rancid*, and the explanation of the change is that a part of the fat has been split into glycerine and fatty acids, the fatty acid being oxidized, and volatile bodies of an unpleasant odor produced. Rancidity, according to the last researches, is to be attributed, not to the presence of microbes, but to the combined action of air and light. The volatile acids and other products of rancidity may be removed by distilling off in steam—the free acid may be neutralized by the treatment with carbonate of soda.

FATTY ACIDS.

Fats cannot be distilled. When strongly heated, they give off a pungent acrid vapor, irritating to the nose and eyes; this is acrolein, which is a product of the decomposition of the glycerin contained in all true fats.

The physiological value of the fats is due partly to their physical, and partly to their chemical characters. The uses of the fat deposited beneath the skin are, first, to protect the body from external shocks by a uniform diffusion of pressure through the whole adipose tissue; and, second, to keep up the heat of the body, by materially checking, through its very slight conducting power, the loss of heat by radiation. This use of the fat is seen most clearly in some of the lower animals (the seal, whale, etc.), which are exposed to very low temperatures. Another physical use of fat is to promote the mobility of various organs.

The chief chemical use of the fat is its power of exciting and supporting the animal heat. In the oxidation of the fats in the animal organism, whether the process be gradual or rapid, a large amount of heat must necessarily be liberated; and that they are oxidized, and for the most part reduced to carbonic acid and water, is evident, because they neither appear in any quantity in the excretions, nor, as a general rule, accumulate beyond a certain point in the organism. An accumulation of fat thus serves as a reservoir of combustible matter in the time of need. This is evident especially in the case of hybernating mammals, in which an enormous quantity is deposited just before the hybernating period: during this period, it gradually disappears, its carbon being slowly consumed in the respiratory process, and keeping up the animal heat. Fat is, moreover, one of the most active agents in the metamorphosis of animal matter. Lehmann ascertained that a certain though small quantity of fat was indispensable to the complete gastric digestion of nitrogenous food, a fact confirmed by the observation that in experiments on artificial digestion, the solution of substances used as food is considerably accelerated by the presence of a little fat. The occurrence of fat in the milk and in the egg, as also in all highly cellular organs (as, for example, the liver), is a clear indication that this substance acts an important part in the process of cell-formation; and no animal-cell or cell-yielding plasma has ever been observed in which fat is not a constituent.

FATTY ACIDS: homologous series of organic acids, so called because certain of the higher members of the series occur in natural fats, and resemble fats in physical properties. General formula, G_nH_{2n+1} COOH or $C_nH_{2n}O_2$. They may be regarded as derivatives of the paraffins, an atom of hydrogen being substituted by carboxyl (COOH). The series is monobasic and saturated. Some of the more important members of the series are here given:

Formic Acid, H. COOH, or CH_2O_2.

Acetic Acid, CH_3.COOH, or $C_2H_4O_2$.

Propionic Acid, C_2H_5. COOH, or $C_3H_6O_2$.

Butyric Acid, C_3H_7. COOH, or $C_4H_8O_2$.
Lamic Acid, $C_{11}H_{23}$. COOH, or $C_{12}H_{24}O_2$.
Myristic Acid, $C_{13}H_{27}$. COOH, or $C_{14}H_{28}O_2$.
Palmitic Acid, $C_{15}H_{31}$. COOH, or $C_{16}H_{32}O_2$.
Stearic Acid, $C_{17}H_{35}$. COOH, or $C_{18}H_{36}O_2$.

At ordinary temperatures, the lower members are colorless liquids, miscible with water, alcohol and ether in all proportions. On passing 'up the series,' they become more oily in character, gradually lose their pungent smell, and become less readily soluble in water. The higher members from $C_{10}H_{26}O_2$, are solid, waxy or fatty substances have only a faint smell, and are insoluble in water, but soluble in alcohol and ether. The first three members are specifically heavier than water, but the specific gravity decreases as the series is ascended, thus, the specific gravity of Formic Acid is 1.24, of Propionic Acid 1.013, of Palmitic Acid, 0.83, and of Stearic Acid, 0.845. In like manner, the acid character becomes less and less pronounced on passing up the series.

FATTY ALCOHOLS: alcohols belonging to the Fatty or Aliphatic (Gr. *aleiphar*, fat) or acyclic division of the Carbon (organic) compounds (q.v.).

FATTY COMPOUNDS: a term applied to all organic compounds whose molecules are considered not to contain a closed chain of carbon atoms; they are thus distinguished from the carbocyclic compounds, such as the Benzene (aromatic) series, the graphic formula of the fundamental compound of which is given in the so-called 'kekulé ring.'

FATUOUS, a. *făt'ū-ŭs* [L. *fatŭŭs*, silly, doltish: It. *fatuo*]: feeble in mind; silly; very defective in intellect: FATUITY, n. *fă-tū'ĭ-tĭ*, or DEMENTIA [F. *fatuité*]: weakness or feebleness in mind, consisting in the impairment or extinction of certain mental powers, or of all. Esquirol has quaintly said that the idiot and imbecile are the poor who have never been rich, but that the fatuous or dements are the rich who have been made poor. This impoverishment is sometimes so extreme, and the sufferer is so little influenced by consciousness as to lose a knowledge of his own existence; and so little influenced by impressions through the external senses, and by the instincts of the sensory ganglia, as to be equally ignorant of the existence of others. Life is vegetative merely. This deprivation may be partial or complete. It may appear as a weakening of sensibility. This is not the tolerance of powerful or painful impressions, or indifference to such, springing from abstraction or engrossment of the attention, but positive extinction of perception; or it may present the more common form of enfeeblement of intelligence, of memory; of the will, where the patient is apathetic, passive, plastic. The disease may involve the affections and the moral sense, and abrogate the power of decision, and all spontaneity of action and thought. Incoherence in ideas and words may be made to constitute another form, though generally regarded as a characteristic; whether it amounts merely to

forgetfulness, or to confusion or irrationality, to inconsecutiveness and inability to express instincts and wishes. Delusions and hallucinations may co-exist with these conditions, but, like the real impressions received by this class of the insane, they are feeble, fugacious, and uninfluential. Under all these aspects, the essential element is privation of power; and this exists as a specific mental disease arising from obvious causes, unassociated with general alienation, acute in its nature, and rapid in its progress. It is most frequently the disease of youth, of the period of puberty, contemporaneous with growth, with debilitating and exhaustive processes, and depending, in all probability, as in the other forms, upon insufficient nutrition of the brain. At this age, the injury is reparable, and what may be designated juvenile dementia, has the rare distinction of being curable. More frequently, it is the sequel of mania, melancholia, and severe affections of the nervous system. The deterioration here arises from actual changes in the nervous structure, which render healthful nutrition impossible; so that, though mitigation, and sometimes to a marvellous extent, is within reach of treatment, recovery is believed impracticable. Again, it is an affection of old age; and though senile dementia may seem but an exaggerated state of dotage, it is accompanied by such marked physical changes, as to leave no doubt that it originates in circumstances differing widely from that gradual degeneration of the tissues which is evidenced by the 'second childishness and mere oblivion.' Lastly, this state may follow fever, when it is transitory, and generally of brief duration. Fatuity is one of the few morbid mental conditions recognized in the legal code as relieving from the consequences of criminal acts, and as disqualifying for the administration and disposal of property. Esquirol, *Des Malad. Ment.* II. p. 219.

FAUBOURG, n. *fō'bûrg* [F.—from mid. L. *foris-burgus*, the burg without or out of doors: comp. Gael. *fo*, under; *borg*, or *burg*, a town or fort]: a suburb; a quarter outside the gates of a city.

FAUCES, n. *faw'sēz* [L. *faucēs*, the upper part of the throat, a narrow inlet: It. *fauci*]: the upper part of the throat; the entrance of the gullet; in *bot.*, the gaping mouth of certain flowers, as the foxglove; in *conch.*, the opening into the first chamber of a shell. FAUCAL, a. *faw'kal*, of or pertaining to the fauces or gullet; specifically, in phonology, applied to certain deep guttural sounds peculiar to the Semitic and some other tongues.

FAUCET, n. *faw'sĕt* [F. *fausset*, a short pipe—from *faulser* and *fausser*, to make a breach in anything]: a short pipe for inserting into a cask to draw off the liquor; OE. spelled *fasset*.

FAUCHER, *fō-shā'*, LEON: 1803, Sep. 8—1854, Dec. 14; b. Limoges: French publicist and statesman. He studied at first philology and archeology; but about the period of the July revolution (1830), betook himself, with enthusi-

asm, to journalism and political economy. He became successively editor of the *Temps*, the *Constitutionnel*, and the *Courrier Français*, 1830-42, publishing many articles on political economy. In 1843, he began to write for the *Revue des Deux Mondes* a series of articles on the industrial condition of England, which appeared in 2 vols. 1845, under the title *Études sur l'Angleterre*, and constitute the most weighty of his productions, though Englishmen reckon the author greatly in error in many points. At the general elections of 1846, he was elected for the manufacturing city of Rheims. In the chamber of deputies, he voted with the dynastic opposition. A ready but not brilliant speaker, he came forward as one of the leading advocates of free trade, and published in the *Siècle*, and in the *Revue des Deux Mondes*, a number of vigorous essays on national economy. After the revolution of 1848, he was both in the constituent and in the legislative assemblies for the dept. of Maine. When Louis Napoleon was chosen pres., Faucher became first minister of public works, and subsequently minister of the interior; but when the pres. proposed to appeal to universal suffrage, Faucher resigned, and after the *coup d'état* he withdrew from political life. Many of his most valuable contributions to the science of politics are in the collection of the *Economistes et Publicistes Contemporains* and in the *Bibliothèque des Sciences Morales et Politiques.*

FAUGH, int. *faw*, and FOH, *fō* [F. *pouah*, faugh: Gael. *fuath*, aversion]: interjections expressing disgust or aversion—similar to *fie* and *phew.*

FAULD, n. *fawld* [etym. doubtful]: tymp-arch or working arch of a furnace.

FAULKNER'S ISLAND: island belonging to N. Y., in Long Island Sound, off Guilford, Conn. It has a lighthouse and a fog-bell.

FAULT, n. *fawlt* [F. *faulte*, or *faute*, a defect, an omission—from It. *falta*, a defect—from mid. L. *fallĭtă*, the act of failing—from L. *fallo*, I deceive: Sp. *faltar*, to lack]: an offense; a slight crime; an error or mistake; a defect; among *miners*, a fissure or break accompanied by a displacement of the strata on each side (see DISLOCATION, in Geol.) FAUL'TED, a. applied to strata fissured and displaced. FAULT'LESS, a free from defect or blemish. FAULT'LESSLY, ad. *-lĭ.* FAULT'LESSNESS, n. FAULTY, a. *fawl'tĭ*, imperfect; containing defects. FAUL'TILY, ad. *-lĭ.* FAUL'TINESS, n. the state of being defective or erroneous. TO FIND FAULT, to express blame or dissatisfaction. TO FIND FAULT WITH, to blame. AT FAULT, puzzled; in a difficulty. FAULT'FINDING, the habit of censuring or blaming frequently on grounds trivial or unjust. FAULT'FUL, a. *-fûl*, in *OE.*, saturated with crime.—SYN. of 'fault': blemish; failing; imperfection; weakness; blunder; vice: foible; want; absence; default;—of 'faultless': blameless; spotless; stainless; perfect.

FAULT: in geology, any rock-crack or fissure with dislocation of the strata. The rock-movement may accompany the formation of the crack, or may come later, and the total movement may vary from a small fraction of a foot to many thousands of feet. Faults come by the same strains and stresses which make folds, the rocks breaking instead of bending; a brittle stratum may be faulted, while softer strata above or below may be only bent. The dip of a fault is the amount of inclination of the plane of fracture from the horizontal; the hade or slope is the complement of the dip, being the amount of inclination of the plane from the vertical. Thus the hade of a fault with a dip of 60° would be 30°. The rock-strata relatively dropped from the downthrow side; the upthrow side is opposite; the side of the fracture that overlies the other is the hanging wall; the underlying side is the foot-wall. The throw of a fault is the total vertical displacement; the heave is the total horizontal displacement—both measured in the plane of the dip. If a fault dips 45° the heave and throw are equal.

Faults are classified as normal and reversed. In a normal or gravity fault the hanging wall is on the downthrow side. In a reversed or thrust fault the hanging wall is on the upthrow side. Normal faults, as the strata occupy more space than before faulting, were produced by tension. Thrust faults are caused by compression, the beds on one side of the fracture being thrust past those on the other. As a rule thrust faults have lower dips than normal faults. The best examples of great normal faults in the United States are in the Arizona-Colorado plateau. Thrust faults are common in the southern Appalachian mountains. Generally a fault-fissure is filled with more or less ground up material from the dislocated strata, and the hanging and foot wall faces are grooved and polished, giving the appearance called slicken-sided.

It is obvious that faults are essentially surface phenomena; for with increasing depth and increasing pressure from above, rocks bend rather than break, and we can easily imagine a depth at which all rocks, while not truly molten, are plastic. See ESCAPEMENT; GEOLOGY; MOUNTAIN; ORE DEPOSIT.

FAUN, n. *fawn* [L. *Faunus,* one of the gods of the fields or woods]: a woodland deity, represented usually with the legs of a goat; a satyr; named from Faunus, a mythical king of Italy, who instructed his subjects in agriculture and the management of flocks, and was afterward worshipped as the god of fields and of shepherds. The festival of the *Faunalia,* Dec. 5, referred to his protection of agriculture and cattle. Fauna was his female complement. He was worshipped also as a prophetic divinity. As deity of the woods and of flocks and herds, he corresponds to the Greek Pan: the idea also arose of a plurality of Fauni or Fauns, like the Greek Satyrs, who were represented as monster deities with short horns, pointed ears, tails, and goats' feet, and to whom all terrifying sounds and appear-

ances were ascribed. FAUNA, n. *fawn'ă*, all the animals peculiar to a country, area, or period. Thus, we speak of the fauna of great Britain, the recent fauna, the fossil fauna, the fauna of the Eocene period or formation, etc. The term bears the same relation to the animal kingdom that *Flora* does to the vegetable. In the fauna of any country are included only those animals indigenous to it, not those which have been introduced. FAUNIST, n. *fawn'ĭst*, a naturalist.

FAUNCE, WILLIAM HERBERT PERRY, American educator: b. Worcester, Mass., 1859, Jan. 15. He is a son of D. W. Faunce (q.v.). He was graduated at Brown University in 1880, and at the Newton Theological Seminary in 1884; held pastorates in Springfield, Mass., 1884-9, and New York 1889-99; was long a trustee of Brown and Rochester universities; lecturer at the University of Chicago; and preacher at Harvard University. He was made president of Brown University in June, 1899.

FAURE, *fōr*, FRANÇOIS FÉLIX: president of the French republic: 1841, Jan. 30—1899, Feb. 16; b. Paris. He was elected pres. 1895, Jan. 17. During the Franco-German war, 1870-71, he organized a battalion of mobile guards, and afterward went to Paris with the Havre firemen to stop the incendiary fires started by the communists. He was elected deputy from Havre to the Chamber 1881, and entered as under-sec. of commerce and colonies in the cabinet which Gambetta formed the same year; occupied the same position in the Ferry cabinet 1883-85, and the Tirard cabinet 1888; and afterward was elected deputy, 1889 and 93. Until 1894, May, he was one of the vice-presidents of the chamber, and was then made minister of the navy in the Dupuy cabinet, which was overthrown by the chamber. The principles advocated by Gambetta and made triumphant by Sadi-Carnot have marked the political course of Faure. Unlike his predecessor in office, however, Faure is regarded, not as a champion of capitalists, but as a representative of the common people, the *bourgeoisie* whose ancestors made the revolution of the 18th c.; and he has shown no disposition to impose upon the people his private views of government. Most of his life has been spent at Havre, where he was a commission and shipping merchant, and at one time pres. of the chamber of commerce. His wealth was accumulated by industry and thrift. He is a good English scholar, and well versed in the study of economica questions; has published important works and reports on the commercial and other interests of France. His election was regarded as a triumph of the moderate republicans.

FAURIEL, *fō-re-ĕl'*, CLAUDE CHARLES: 1772, Oct. 21—1844, July 15; b. St. Etienne, dept. of Loire: French philologist, historian, and critic. He studied at the college des Oratoriens at Tournon, afterward at Lyon, and 1799, was appointed to a situation under Fouché; but destitute of political ambition or predilections, and passionately fond

of learned studies, Fauriel resigned his office 1802, and turned to literature. He made himself familiar with Sanskrit, Arabic, and the treasures of classical antiquity and of the middle ages; and though he did not write much, yet what he wrote was of great value. Renan may exaggerate when he affirms that Fauriel 'put in circulation the greatest number of ideas' of any contemporary writer; but even the Germans allow that in many points of literary history, criticism, and philology, Fauriel was 20 years in advance of his age. After the July Revolution, he was appointed prof. at the Sorbonne; in 1836, he published his chief work, *Histoire de la Gaule Méridionale sous la Domination des Conquérants Germains* (4 vols. Paris), one of the best specimens of historical investigation and art in modern times. Worthy of notice, also, particularly for its remarkable historical introduction, is his edition of the Provençal rhymed chronicle, *Histoire de la Croisade contre les Hérétiques Albigeois* (Paris 1837). One of Fauriel's best known essays is that on the origin of the Epic of Chivalry in the middle ages. He died at Paris. Two years after his death appeared a collection of his professorial lectures, *Histoire de la Poésie Provençale* (3 vols. Paris 1846), in which Fauriel endeavors, with great erudition and originality of criticism, to show that to the Provençals, must be attributed the composition and primitive development of the greater portion of the romances of chivalry, including those which describe the contests of the Christians and Moors in Spain, and those which form the Charlemagne cycle, thus finding the origin of the old Spanish and German poetry on the soil of France. These views have found some strong opponents.

FAUSSE BRAIE, or BRAYE, *fōs'brā* [F. *fausse*, false, *braie*, breeches]: in *fortification* a low rampart encircleing the body of a place, and raised about three ft. above the level ground; mostly discarded by modern engineers, except in front of curtains, under the name of *Tenailles* (q.v.). The French engineers gave this title to the work as an adaptation from the Italian term *Fossa Brea*, which had its origin from the Fausse Braie being commonly in the ditch, in front of the main wall. The fausse braie had the advantage of giving an additional tier of guns for defensive purposes; but the still greater disadvantage of affording facilities for the scaling of the parapet.

FAUSSE RIVIÈRE, *fōs rē-vē-àr'* (*False River*): lake of Louisiana, notable as an index of the physical character of the country. Till about a century and a half ago, it was a channel of the Mississippi—a fact which probably is expressed in its name. Here, as in other alluvial formations, the beds of the running waters are undergoing incessant changes.

FAUST, *fowst*, DOCTOR: according to tradition, a celebrated dealer in the black art, during the latter half of the 15th, and the beginning of the 16th c.; frequently confounded with Johann Faust (or Fust); b. Knittlingen, in Würtemburg: or, as some say, at Roda near Weimar. He

is said to have studied magic at Cracow. After having spent a rich inheritance left him by his uncle, Faust is alleged to have made use of his 'power' to raise or conjure up the devil, with whom he entered into a contract for 24 years, obtaining during that time his fill of earthly pleasure, but at its termination surrendering body and soul into the hands of the Great Enemy. The devil gave him an attendant spirit or demon called Mephistopheles—other names are given by the later traditionists,—with whom he travelled about, enjoying life in all its forms, and astonishing people by working wonders, till he was finally carried off by the Evil One, who appeared in terrible guise, between twelve and one o'clock at night, at the village of Rimlich, near Wittenberg, though several other places lay claim to that very questionable honor. Some have doubted, considering the monstrously mythical form in which his career has come down to us, whether such an individual as Faust ever existed; but it is now generally believed that there was a basis of fact, on which tradition has built its grotesque superstructure. Gorres, indeed, asserts that one George Sabellicus, who disappeared about 1517, is the real Faust; but Philip Melancthon—the man of all the reformers whose word in regard to a matter of fact would most be trusted—says that he had himself conversed with Dr. Faustus. Conrad Gesner (1561) is equally positive; and Luther, in his *Table Talk*, speaks of Dr. Faust as a man lost beyond all hope. The opinion that prevails, reckoned intrinsically the more probable, is that some man of this name, possessed of varied knowledge, may possibly have practiced jugglery (for all the wandering savans of the middle ages had a touch of the quack about them), and thus have been taken by the ignorant people for a dealer in the black art, and one who maintained a secret and intimate relation with evil spirits. His widely diffused celebrity not only occasioned the wonders worked by other so-called necromancers of an earlier age—Albertus Magnus, Simon Magus, and Paracelsus—to be attributed to him, but likewise many ancient tales and marvellous legends were gradually transferred to him, till he appears finally the very hero of magicians. But while, on the one hand, the narrative of Faust's marvels afforded amusement to the people, on the other, they were made use of for instruction by the clergy, who pointed out, in the frightful fate of Faust, the danger of tampering with the 'black art'; and the abominableness of a life sunk in sensuality and vice'. The myth of Faust has received a manifold literary treatment. First come the *Volksbücher* (or people's books), which record Faust's enterprises and feats: the oldest known appeared at Frankfort 1588. Then came an 'improved' edition of the same by Widmann, *Wahrhaftige Historien von denen gräulichen Sünden Dr. Joh. Faust's* (True History of the Horrible Crimes of Dr. John Faust, Hamb. 3 vols. 1599); and 1695, a work was published at Nürnberg by Pfitzer, based upon that of Widmann. The oldest of these books was translated into all languages of civilized Europe.

Impostors also published books of magic under the name of Faust, such as *Faust's grosser und gewaltiger Höllenzwang* (Faust's Great and Potent Book of Spells), *Fausten's Miraculkunst* (Faust's Art of Performing Miracles), and *Dreifache Höllenzwang* (The Threefold Book of Spells). These wretched productions are filled with meaningless scrawls and figures, interspersed with texts from the Bible scandalously misapplied; but in the belief of the vulgar, they were supposed capable, when properly understood, of accomplishing prodigies. That the poetical art should in due time have seized on a subject affording so much material for the fancy, was inevitable; consequently German literature abounds in elegies, pantomimes, tragedies, and comedies on Faust. Since the end of the 17th c. the *Puppenspiel* (Puppet-show) of Dr. Faust (published first at Leipsic 1850) has been one of the most popular pieces in Germany. It forms the transition from the rude magic tales concerning Faust, to the later philosophic conception of the Faust-myth, which has become the most perfect poetical expression of the eternal strife between Good and Evil in the soul of man. The first writer who treated the story of Faust dramatically was the English writer Christopher Marlowe, about 1600 (German translation by W. Müller, Berlin 1818); but the grandest work on the subject is Goethe's *Faust*, the first part of which appeared under the title of *Dr. Faust, ein Trauerspiel* (Leip. 1790), and afterward in a remodelled form, *Faust, eine Tragödie* (Tübingen 1808). The second part was published after Goethe's death, Stuttgart 1833. Besides may be mentioned Lessing's masterly fragment, *Faust und die Sieben Geister* (Faust and the Seven Spirits), G. F. L. Müller's *Dr. Faust's Leben* (Dr. Faust's Life, Manh. 1778), and Klinger's *Faust's Leben, Thaten, und Höllenfahrt* (Faust's Life, Doings, and Descent into Hell; Petersb. and Leip. 1791). The plastic art also has found a fit subject in Faust. In Auerbach's cellar at Leipsic where Faust is said to have performed many of his feats, are two rude daubs of date 1525, representing Faust and Mephistopheles riding out of the cellar on a wine-barrel. Rembrandt and Christoph von Sichem have illustrated the story of Faust, and, in modern times, Cornelius and Retzsch have done the same. See Peter's *Die Literatur der Faustsage* (3d ed. 1857); Engel's *Das Volksschauspiel Dr. Faust* (1873).

FAUST (or Fust), Johann: d. 1460: chief promoter of the invention of printing, a rich citizen of Mayence: see Gutenberg.

FAUSTINA, *faws-tī'na*, Annia Galeria (*Faustina Senior*): wife of the Roman emperor, Antoninus Pius: died A.D. 141. Also, her daughter, Faustina Junior, wife of the Roman Emperor Marcus Aurelius Antoninus (successor to Antoninus Pius): d. 175 at a village near Mount Taurus. Both, but particularly the younger, were notorious for the profligacy of their lives, which their exemplary husbands in vain endeavored to check. After

their deaths, institutions for the relief of poor girls were founded both by Antoninus and Marcus Aurelius in memory of them, and were called '*puellæ alimentariæ Faustinæ*'. Marcus Aurelius, in his Meditations, speaks highly of his wife; and an attempt has been made by Wieland to defend her against the imputations of the historians of the emperors.

FAUSTINUS I., *faws-tī'nŭs:* Emperor of Hayti, known, before his elevation to the throne, as Faustinus Soulouque: 1789–1867, Aug. 6 (reigned 1849–1859); b. San Domingo; a negro originally in very humble circumstances. In his earlier years, he acted as servant, afterward as adjutant, to Gen. Lamarre. He subsequently served under Presidents Petion and Boyer, and by the latter was raised to the rank of captain. After 1844, when the Haytian Republic—of which Gen. Boyer was then president—was dissolved, a struggle for the supreme power ensued, in which Faustinus took an important part. In 1847 he was appointed by the senate pres. of the republic. A dreadful massacre of the mulattoes in Port-au-Prince, took place at his instigation, 1848, Apr. 16, which, with similar measures, struck terror into the hearts of his opponents. In 1849, Aug., he had himself proclaimed Emperor of Hayti, a title which he held for about ten years; but a revolution having broken out 1858, and a republic having been declared, Faustinus was forced to abdicate, 1859.

FAUTEUIL, n. *fō-tŭl'* [F.—from OF. *fauldetueil*—from mid. L. *faldĭstōlĭŭm*]: an arm-chair, generally highly ornamented; a president's chair: see FALDSTOOL.

FAUVETTE, *fō-vĕt':* French name, partially adopted in English, for some of the little song-birds of the family *Sylviadæ* or Warblers, having straight slender bills slightly compressed in front, the ridge of the upper mandible curving a little towards the tip, and the legs not long. They mostly belong to the genus *Curruca*, as the Blackcap, the Pettychaps, or Garden Warbler, the Whitethroat, etc., and to the genus *Salicaria*, as the Sedge Warbler, the Reed Warbler, etc. The Dartford Warbler (*Melizophilus Provincialis*), also is called Fauvette. They are all very lively little birds, continually flitting about in pursuit of insects, mostly frequenting bushy places; and some of them, particularly those of the genus *Salicaria*, preferring watery situations where reeds abound.

FAUX-BOURDON, n. *fō-bôr-dŏng* [F. *faux*, false; *bourdon*, a drone bass, a series of similar notes or a holding note as an accompaniment to the melody]: in *mus.*, a sort of harmony used by the old composers, and consisting of thirds and sixths added to a canto fermo.

FAUX-JOUR, n. *fō-zhôr* [F. *faux*, false; *jour*, day, light]: false or contrary light; in *art*, false light; a term denoting that the light in which a picture is hung falls on it in a different direction from that in which the painter has represented it as coming.

FAUX-PAS, n. *fō-pâ* [F. *faux*, false; *pas*, step]: false step; mistake; breach of propriety, manners, or morality; a lapse from chastity.

FAVARA, *fâ-vâ′râ:* town of Sicily, in the s. of the island, province of Girgenti, four m. s.e. of the town of Girgenti. It has rich sulphur-mines. Pop. 16,000.

FAVART, *fâ-vâr′*, CHARLES SIMON: 1710, Nov. 13—1793, May 12; b. Paris: French dramatist. He became known by his *La Chercheuse d'Esprit*, performed 1741. In 1745 he married Mademoiselle Duronceray, herself a dramatic writer of some note and a singer of remarkable talent, and in the same year became director of the *Opéra Comique*. The fine taste and judgment of Favart and his wife soon obtained for their theatre great reputation. It was they who made the first attempt to harmonize the costume of the actors and actresses with their impersonations, and to put a stop to the ridiculous practice of decking out soubrettes and country-girls in the attire of court-ladies. So powerful, however, was the opposition excited by the jealousy of the other theatres, that the *Opéra Comique* was closed in the first year of its existence. After some time spent with Maréchal de Saxe during his campaign in Flanders, Favart and his wife (who d. 1772) returned to Paris, where the former continued to write operas. Favart's success as a writer was very great: he may be reckoned the father of the comic opera, and the happy successor of Le Sage, Piron, etc. The number of his pieces is about 60, of which the most celebrated are *Comment l'Esprit vient aux Filles, Le Coq du Village, Bastien et Bastienne, Ninnette à la Cour, Les Trois Sultanes*, and *L'Anglais à Bordeaux*. His works have been published several times. An edition in 10 vols. was published, Paris 1810, under the title of *Théâtre de Monsieur et Madame Favart*. A very interesting book, *Les Mémoires et la Correspondance de Favart*, giving pleasing glimpses of the literary and theatrical world of the 18th c., was published by his grandson, Paris 1809.

FAVELLA, n. *fă-vĕl′lă* [L. *favus*, a honeycomb: perhaps L. *favilla*, hot cinders or ashes]: in *bot.*, a kind of conceptacle among the algæ. FAVOSE′, a. *-vōs′*, in *bot.*, honeycombed; cellular. FAVUS, n. *fā′vŭs*, a disease of the skin, commonly known as scaldhead. FAVOSITES, n. *făv′ō-sīts*, in *geol.*, genus of lamelliferous corals, found in Silurian, Devonian, and Carboniferous strata. They were social corals, closely packed together, no space being left between the walls of the different corallites. As in the other palæozoïc corals, the lamellæ are developed in multiples of four, and the older portion of the stony base is partitioned by horizontal tabulæ. FAV′ULA′RIA, n. *-ūlā′-rĭ-ă*, in *geol.*, a genus of coal-measure stems whose leaf-scars resemble the arrangement of a honeycomb: see SIGILLARIA.

FAVEOLATE, a. *fa-vē′o-lāt:* formed like a honeycomb; alveolate; cellular.

FAVEROLE, n. *făv'ėr-ōl* [F. *faverolle*, a haricot bean, dim. of L. *faba*]: in *bot.*, water dragons, *Calla pallustris*.

FAVERSHAM, *făv'ėr-sham:* municipal borough and seaport in the n. of Kent, England; on a navigable creek, opposite Sheppey Isle, 8 m. w.n.w. of Canterbury. It consists chiefly of four streets in an irregular cross. It has a valuable oyster-fishery, employing 200 to 300 persons. It sends much agricultural produce to London by hoys. The creek admits vessels of 150 tons. In the vicinity are some of the most important gunpowder factories in the kingdom. Under the name of Favresfield, it was a seat of the Saxon kings, where Athelstan, 930, held a Witenagemôte. It has the remains of an abbey founded by King Stephen, where he and his queen, Matilda, are buried. St. Crispin is said to have been apprenticed to a shoemaker here. Near Faversham are some chalk caverns, with columns. Pop. (1901) 11,290.

FAVIGNANA, *fâ-vēn-yâ'nâ:* chief of the Ægades, a group of islands in the Mediterranean, off the w. coast of Sicily. It is six m. from the Sicilian shore, and is about six m. long, with an average breadth of two miles. It has a town of the same name, with two castles, and a pop. about 5,000. Favignana is fruitful, has good pasturage, and produces excellent wine.

FAVILLA: see FAVELLA.

FAVONIAN, a. *fă-vō'nĭ-an* [L. *Favonius*, the west wind]: pertaining to the west wind; hence, gentle, favorable, prosperous.

FAVOSITES, FAVULARIA, FAVUS, etc.: see FAVELLA.

FAVOR, or FAVOUR, n. *fā'vėr* [F. *faveur*—from L. *favōrem*, good-will—from L. *favĕō*, I befriend: It. *favore*]: kind regard; good-will; grace; support; patronage; a kind act or office; a gift; bows of white satin ribbons, as a wedding-favor, distributed at marriages in some countries, usually pinned on the breast of all concerned, attendants and postilions included. The favors of those more immediately interested are sometimes enriched with orange blossom. This is an old usage, connected with the love-knot of ancient northern nations.—See Brand's *Popular Antiquities*, article 'Bride Favours'; something given to be worn, as ribbons; anything worn as a token; in *OE.*, feature; countenance: V. to assist; to befriend; to afford advantages for success. FA'VORING, imp.: ADJ. countenancing; facilitating. FA'VORED, pp. *-vėrd*, treated with favor; featured [*well* or *ill*]: in *OE.*, resembled in any way. FAVOREDNESS, n. *fā'vėrd-nĕs*, appearance good or bad. FA'VORABLE, a. *-vėr-ă-bl* [F. *favorable*]: friendly; kind; propitious. FA'VORABLY, ad. *-ă-blĭ*. FA'VORABLENESS, n. *-bl-nĕs*. FA'VORINGLY, ad. *-lĭ*. FA'VORER, n. *-ėr*, one who. FA'VORITE, n. *-vėr-ĭt*, one preferred before others: ADJ. esteemed; beloved; preferred. FA'VORITISM, n. *-ĭzm*, the disposition to favor or promote the interest of one before

another.—Syn. of 'favor n.': kindness; present; benefit; countenance; lenity; promotion; befriending; benevolence; good-will; token; partiality; bias; letter; epistle.

FAVRE, *fâvr*, Jules Claude Gabriel: 1809, Mar. 21—1880, Jan. 19; b. Lyon: French advocate and minister. He was son of a merchant, studied for the bar, and passed at Lyon, 1830. His political opinions were always intensely republican, and when pleading in numerous political lawsuits, Favre frequently placed the state solicitors, and even the judges, in a very embarrassing position, by the boldness of his sentiments. As the defender of the *Mutuellists* at Lyon 1831, he was in danger of losing his life; this, however, did not prevent him from defending those who had been impeached in April, and commencing his speech with *Je suis Républicain.* From 1834, Favre was a member of the Paris bar. In the revolution of 1848, Feb., he was home sec., in which capacity he wrote the notorious circular for which Ledru-Rollin's administration was so severely reproached, investing the commissioners of the republic with dictatorial authority in the provinces. He was active as a member of the committee of foreign affairs. After the election of Dec. 10, Favre showed himself a persistent antagonist of Louis Napoleon, and after the flight of Ledru-Rollin, became the orator of the Mountain. The *coup d'état* closed his political career at this time. He refused to take the oath of fidelity to the imperial government, and betook himself again to his profession. In 1858, he defended Orsini, on his trial for a conspiracy to murder. In the same year, however, he became a member of the legislature. In 1870, Sep., after the downfall of the empire, he was appointed minister of war, and carried on negotiations with Count Bismarck. He resigned office 1871, July, and resumed practice at the bar. Favre was greatest in political repartee, and though long accustomed to public strife, his language was noted for Attic elegance.

FAVUS, *fā'vus* [see Favella]: disease of the skin, chiefly of the hairy scalp, characterized by yellowish dry incrustations more or less roundish, and often cup-shaped, composed of the sporules and mycelia of a vegetable growth, *Achorion schœnleinii*, belonging to the order of Fungi (q.v.). The disks of favus are produced with great rapidity, and spread rapidly, if not attended to at the first, over the whole scalp, destroying the bulbs of the hair, which becomes very short and thin, and then falls out altogether. Favus is disgusting and unsightly, but hardly dangerous; it is contagious, but spreads chiefly where cleanliness is greatly neglected, and is therefore almost unknown among the better classes. It is far more common among children than among adults. The cure is sometimes attempted by a variety of medicated and simple ointments, and by pulling out the hair by the roots, or *epilation*, as it is called; but it seems hardly possible in inveterate cases to be rid of the disease without a very long persistence in habits of most scrupulous cleanliness; therefore the cure

is seldom permanent, though easily attained for the time. Favus is almost always followed by permanent baldness of the parts affected; unlike ringworm (q.v.), which is a minor disease of the same order.

FAWCETT, *fâ'set*, Edgar, American novelist and poet: b. New York 1847, May 26; d. London, England, 1904, May 1. He was graduated at Columbia College in 1867. His novels are: *Purple and Fine Linen* (1873); *A Hopeless Case* (1880); *A Gentleman of Leisure* (1881); *An Ambitious Woman* (1883); *Rutherford* (1884); *Tinkling Cymbals* (1884); *The Adventures of a Widow* (1884); *Social Silhouettes* (1885); *The Confessions of Claude* (1886); *The House at High Bridge* (1887); *Miriam Balestier* (1888); *A Man's Will* (1888); *Olivia Delaplaine* (1888); *A Demoralizing Marriage* (1889); *Fabian Dimitry* (1890); *A New York Family* (1891); *An Heir to Millions* (1892); *Women Must Weep* (1892); *A Mild Barbarian* (1894); *New York: a novel* (1898); *Voices and Visions* (1903); in 1889 published *Agnosticism and Other Essays; Outrageous Fortune* (1894); etc. His poetical works include: *Short Poems for Short People* (1872); *Fantasy and Passion* (1877); *Song and Story* (1884); *Romance and Revery* (1886); *The New King Arthur; Songs of Doubt and Dream* (1889).

FAWCETT, Henry, m.a., d.c.l.: 1833–1884, Nov. 6, b. Salisbury, England: economist. He graduated at Trinity Hall, Cambridge, 1856; lost his eyesight by an accident 1858; was appointed prof. of political economy at Cambridge 1863; was elected member of parliament 1865, 68, 74; appointed postmaster-gen. in Gladstone's administration 1880, Apr.; and had his great scheme of post-office annuities put in general operation 1884, June. While postmaster-gen. he introduced many reformatory measures, and proved himself progressive and efficient. Among his numerous works are: *Manual of Political Economy* (1863); *Economic Position of the British Laborer* (1865); *Pauperism* (1871); and *Free Trade and Protection* (1878). He was appointed a privy councilor 1880, received the degree d.c.l. from the Univ. of Oxford, 1880, and that of doctor of political economy from the Univ. of Würtzburg 1882.

FAWKES, *fawks*, Guy (properly Guido): 1570–1606, Jan. 31; b. of a Prot. family in Yorkshire, England: head of the conspiracy known by the name of the Gunpowder Plot. He became a Rom. Catholic at an early age, and served in the Spanish army in the Netherlands. Inspired with fanatical zeal for his new religion, on his return to England, he entered into a plot with several Rom. Cath. gentlemen for blowing up the king, his ministers, and the members of both houses at the opening of parliament, 1605, Nov. 5. Guy Fawkes was taken with the burning match in his hand, tried, and after having been put to the torture, was publicly put to death. In remembrance of this event, in most large English towns, particularly in London, a grotesque figure, stuffed with straw, is carried about the streets on Nov. 5, and finally committed to the flames. A

political and religious signification was again imparted to this custom by what was called 'the papal aggression' 1850, when the figure of Cardinal Wiseman (q.v.) was substituted for that of Guy Fawkes.

FAWN, n. *fawn* [OF. *faon*, the young of any animal, then a doe or fawn—from mid. L. *fætonus*, a little offspring—from L. *fætus*, offspring, progeny]: a young deer. FAWN, or FAWN-COLORED, light-brown like a fawn. FAWN'ING, imp. bringing forth a fawn.

FAWN, v. *fawn* [Goth. *faginon*, to rejoice: AS. *fægen*, joyful: Icel. *fagna*, to rejoice: comp. Gael. *fàn*, to dance attendance]: to carry to excess the appearance of pleasure; to court favor; to flatter meanly; to cringe. FAWN'ING, imp.: ADJ. flattering by cringing and meanness. FAWNED, pp. *fawnd*. FAWN'ER, n. one who. FAWN'INGLY, ad. *-lĭ*, in a cringing manner.

FAWSONT, a. *faw'sŏnt* [Gael. *fasanta*, customary, respectable]: in *Scot.*, respectable; in accordance with custom and fashion. FAUSONED, a. *faw'sŏnd*, in *OE.*, fashioned.

FAY, n. *fā* [F. *fée*, a fay, an elf (see FEY)]: a fairy; an elf.

FAY, v. *fā* [Ger. *fügen;* Sw. *foga;* AS. *fegan*, to join together]: in *ship-building*, to join two pieces of timber close together. FAY'ING, imp. FAYED, pp. *fād*.

FAY, *fâ'ĕ*, ANDRÁS: 1786–1864; b. Kohany, in the county of Zemplén: Hungarian author. He studied philosophy and law at the Prot. college of Sárospatak, and then applied himself to literary pursuits. After two vols. of poetry, appeared the collection of Fables (*Mesék*, Vien. 1820), which gave him repute. The fables are like those of Phædrus and La Fontaine, but in prose. Richness of invention, simplicity of design, and truth of character are evident in this work. Among Fay's dramatic works are the tragedy, The Two Bathorys (*A Két Báthory*, Pesth 1827); the comedies, Ancient Coins (*Régi Pénzek*), and Hunters in the Matra (*Mátrai Vadászok*). The novel, The House of the Béltekys (*A' Béltéky-haz*, Pesth 1832), is rather didactic, but exhibits many features of Hungarian domestic life. Fay was a constant contributor to literary and scientific periodicals, and had his share in some of those pamphlets by which great social questions, for instance, female education, savings-banks, etc., were brought to a successful issue in Hungary. In reading Fay's works, we are frequently reminded of Dean Swift. Fay was foremost among the leaders of the liberal opposition in the county sittings of Pesth 1825–40; but on the appearance of Kossuth, the strides of public life growing more and more rapid, Fay gradually retired from political controversy. The first savings-bank of Hungary (at Pesth) was entirely Fay's work. His literary works were published in eight vols. Pesth, 1843–4.

FAY, CHARLES ERNEST, American educator and mountain climber: b. Roxbury, Mass. 1846, Mar. 10. He was

graduated from Tufts College in 1868 and has been professor of modern languages there from 1871. He has been several times president of the Appalachian Mountain Club and has been very prominent in the development of mountaineering in the Canadian Rocky and Selkirk mountains. He has lectured publicly on literary and geographical themes, and has edited *Appalachia* since 1879. He has written: *Modern Language Lines* (1884); *Recent Solution of the Greek Question, Schools and College* (1892).

FAY, *fā*, JONAS: 1737, Jan. 17—1818, Mar. 6; b. Hardwick, Mass.: patriot. He was educated for a physician, but spent the greater part of his life in public service. He was an army surgeon under Col. Ethan Allen at Ticonderoga; member of the convention which declared Vt. an independent state, and author of the declaration 1777; sec. of the state constitutional convention 1777, July; member of the council of safety; member of the state council 1778–85; judge of the supreme court 1782, and of probate 1782–87; and state agent of Vt. in congress 1777, Jan., 1779, Oct., 1781, June, 1782, Feb.

FAY, THEODORE SEDGWICK: author: b. New York, 1807, Feb. 10; d. Berlin, Germany, 1898, Nov. 17. He studied law, but abandoned it to become associate editor of the *New York Mirror* with George P. Morris and Nathaniel P. Willis, 1828. He spent several years in European travel, was sec. of the American legation at Berlin 1837–53, and U. S. minister-resident at Berne, Switzerland, 1853–61. He has published a notable series of papers on Shakespeare, a story of New York life, *Norman Leslie*, which was dramatized and played with success, and *Dreams and Reveries of a Quiet Man* (1832); *The Minute Book* (1833); *Sydney Clifton* (1839); *Countess Ida* (1840); *Hoboken, a Romance* (1843); *Robert Rueful* (1844); *Ulric, or the Voices*, poems (1851); *Views of Christianity* (1856); *History of Switzerland* (1860); *Great Outlines of Geography* (1867); and *First Steps in Geography* (1873).

FAYAL, *fī-ăl'*: one of the most important of the Azores (q.v.): area about 69 sq. m. It is very fertile, and has a dense population. In its centre is a mountain 3,000 ft. in height; and on its s.e. coast a convenient bay with good anchorage. Its principal town, Horta, is on this bay, lat. 38° 30′ n., and long. 28° 41′ w. Pop. of the island 40,000.

FAYALITE, n. *fā'ă-līt* [from *Fayal*, one of the Azores; Gr. *lithos*, a stone]: a pure iron chrysolite of a greenish or brownish-black color.

FAYBERRY, n. *fā'bĕr-rĭ*: the gooseberry.

FAYERWEATHER, *fär'wĕth-ėr*, DANIEL B.: merchant and philanthropist: 1821–1890, Nov. 15; b. in Stepney, Conn. At the termination of an apprenticeship with a farmer, he learned the shoemaker's trade, in Bridgeport, Conn., and afterward became a pedler of tinware, in Virginia, often taking pelts for payment. Returning to his trade in Bridgeport, he remained there till 1854, when he removed to New York, entering the employ of Hoyt Bros.,

dealers in leather. In 1870, the firm was dissolved, and later the business was conducted under the firm-name of Fayerweather & Ladew. In financial circles Mr. Fayerweather was noted for strict commercial honor. His habits were retiring and economical, but he was judiciously charitable. He was so little known outside of his circle of business acquaintances and personal friends that the publication of his will, bequeathing more than $2,000,000 to various charitable and educational institutions, and directing that $3,000,000 more be placed in the hands of executors for distribution among public institutions according to private instructions, attracted much attention. Among his bequests were: $25,000 to the Presbyterian Hospital, $25,000 to St. Luke's Hospital, $25,000 to the Manhattan Eye and Ear Infirmary, $10,000 to the Woman's Hospital, $10,000 to Mount Sinai Hospital, all in New York; $200,000 to Yale Univ. and $100,000 to its Scientific School, $200,000 to Columbia Univ., $200,000 to Cornell Univ., $100,000 to Bowdoin College, $100,000 to Amherst College, $100,000 to Williams College, $100,000 to Dartmouth College, $100,000 to Wesleyan Univ., $100,000 to Rochester Univ., $100,000 to Hamilton College, $100,000 to the Univ. of Virginia, $100,000 to Lincoln Univ., $100,000 to Hampton Univ., $100,000 to Maryville College, and $50,000 each to the Union Theol. Seminary, and Marietta, Lafayette, Wabash, Adelbert, and Park colleges. In 1891, his widow began legal proceedings to oppose the probating of the will. She did not object to the public bequests, but was not willing to have the executors receive $3,000,000. Subsequently the suit was withdrawn, on an agreement to divide the residuary estate between Yale, Harvard, Princeton, Columbia, and the Woman's and Presbyterian hospitals in New York.

FAYE'S COMET: discovered by Hervé Auguste Étienne Albans Faye, 1843, Nov. 22, in the constellation of Orion. It had a short tail and bright nucleus and has since been seen 1850, Nov. 28, 1858, Sep. 12, 1869, and late in 1888, but at no time has it been visible to the naked eye. Leverrier computed its entrance into the solar system about 1747, and established its mean distance from the sun at 3.8118 times that of the earth, eccentricity .5576, inclination 11° 22′ 7″, period 7.414 years, and motion direct. Its discoverer was born in Saint Benoit, Indre, France, 1814, Oct. 5, studied astronomy with Arago, became prof. of astronomy 1873, and director of the national observatory at Paris, 1878, Jan.

FAYETTE, *fā-et′*, Iowa, town in Fayette County; on the Chicago, M. & St. P. R.R.; 65 miles northwest of Dubuque. It is the seat of Upper Iowa University, a Methodist Episcopal institution founded in 1857, one year after the settlement of the town. It is located in an excellent agricultural section. Pop. 3,000.

FAYETTE, Mo., city, county-seat of Howard County; 105 miles east by south of Kansas City; on the Missouri,

K. & T. R.R. It is the seat of the Howard Payne College for women, founded in 1844, and the Central College, coeducational, founded in 1857, both under the auspices of the Methodist Episcopal, South, Church. It is in an agricultural section and the trade and industries are connected with agricultural products. Pop. 3,000.

FAYETTEVILLE: a city and cap. of Washington co., Ark., in the Ozark Mountains; 1,500 ft. above the sea; on the St. Louis and San Francisco railroad. It is called the 'Athens of Arkansas,' and is a popular summer resort. It is the seat of Arkansas Industrial University; is the fruit center for northwestern Arkansas; and has flour mills, fruit evaporating establishment, large wagon factory, foundry, etc. Pop. (1910) 4,471.

FAYETTEVILLE, *fī'ĕt-vĭl:* city of N. Car.; on the left bank of Cape Fear river, about 140 m. from its mouth. Fayetteville marks the head of natural navigation of the river; though by locks and dams it communicates with the upper basin of the river. The interior sends down coal, and the neighborhood is covered with forests of pine, traversed by 350 m. of plank road, and yielding tar and turpentine, of which latter there are several distilleries. Cotton and flour manufacture are largely carried on by water-power. The extensive arsenal of Fayetteville was seized by the Confederates 1861, and destroyed by Sherman 1865. Pop. (1900) 4,670; (1910) 7,045.

FAYUM, *fī-ôm':* Egyptian province, surrounded, in the form of a basin, by the Libyan Desert, and connected merely by a narrow valley with that of the Nile; between lat. 29°–30° n., and 30°–31° e. This peculiar depression of the desert extends about 30 m. from n. to s., and about 40 m. from e. to w., its lowest point lying 100 ft. below the banks of the Nile at Benisuef. Fayum is one of the most fertile provinces in Egypt; producing, in addition to the ordinary useful plants of the country, roses, apricots, figs, vines, olives, etc. in great quantities. This fertility, in a province the soil of which is naturally arid and sandy, is the result of irrigation. A canal from the Nile was, at an early period, dug westward, through a gorge in the Libyan hills which here skirt the w. bank of the Nile, and after dividing into numerous branches, lodged its waters in a depression in the n.w., thus forming, it is said, the Lake Mœris (q.v.). The anc. capital of the province, called Krokodilopolis, and later Arsinoë, stood on the e. shore of Lake Mœris; and upon its ruins stands Medînet-el-Fayûm, chief town of the province, with pop. 33,069; pop. of province 371,006.

FEAL, n. *fēl* [OF. *fiel* or *feel*—from L. *fĭdēlĭs*, faithful]: in *OE.*, faithful, as a tenant or knight to his lord.

FEAL, n. *fēl*, or FAIL, n. *fāl:* in *Scot.*, any grassy part; a grass-sod: turf (see PEAT). FEAL-DIKE, a wall built of sods. FEAL AND DIVOT, a predial servitude (q.v.) peculiar to the law of Scotland, in virtue of which the proprietor of the dominant tenement possesses the right of turning up

and carrying off turf from the servient tenement for the purpose of building fences, roofing houses, and the like. The etymology of these words has been much disputed: Jamieson derives divot from *delve* (Sax. *delfan*, or *delven*), or, as alternative, says that it may have been formed by the monkish writers of old characters from *defodere*, to dig the earth: the former is more probable.

FEALTY, n. *fē′ăl-tĭ* [OF. *féelté* and *fealte*, fidelity—from L. *fidelĭtātem*, fidelity—from *fidēlĭs*, faithful, trusty: It. *fedele*, faithful]: loyalty; fidelity of a tenant or vassal to his superior. Fealty was anciently embodied in an oath, by which the tenant bound himself to the requisite service or dues, on entering to the lands. In taking the oath of fidelity, Littleton says, s. 91, that the tenant shall not kneel, nor shall make such humble reverence as in homage. The only object of fealty in modern times is to keep up the evidence of tenure where no other services are due; but even to this effect it has gone into desuetude.

FEAR, n. *fēr* [AS. *fær;* Dut. *vaar*, fear: Icel. *far;* Sw. *fara*, danger: comp. Gael. *fuar*, cold, as the sensation created by great danger]: apprehension or slight dread of evil; an uneasy or painful emotion excited by impending danger; reverence; due regard; the object or cause of fear: V. to feel an uneasy emotion of impending danger; to be anxious; to reverence. FEAR′ING, imp. FEARED, pp. *fērd*. FEAR′FUL, a. *-fûl*, timorous; affected with fear; inspiring fear. FEAR′FULLY, ad. *-lĭ*, in a fearful manner; in a manner to be reverenced. FEAR′FULNESS, n. FEAR′LESS, a. bold; courageous. FEAR′LESSLY, ad. *-lĭ*. FEAR′LESSNESS, n. boldness; intrepidity. FEARSOME, *fēr′sŭm*, fearful; terrible; dreadful; awful.—SYN. of 'fear, n.': dread; terror; alarm; awe; dejection; anxiety; solicitude; apprehension;—of 'fear, v.': to dread; apprehend; frighten; affright; terrify; venerate;—of 'fearful': timid; afraid; awful; terrible; dreadful; frightful; apprehensive; horrible; distressing; shocking;—of 'fearless': daring; intrepid; brave; heroic; undaunted; dauntless; bold; courageous; valorous; valiant.

FEAR: an instinct and emotion, common to man and many animals, aroused by the presence of danger, and manifesting itself sometimes by flight and sometimes by immobility and paralysis. Morbid fears occur in some mental derangements, such as melancholia; the cause of many of them is probably to be sought in some disorder of the vascular, respiratory, or digestive organs. Other curious fears are seen in psychasthenia, and are called *phobias*. See EMOTION.

FEAR, MANIA OF, or PANOPHOBIA, *păn-ō-fō′bĭ-a:* morbid or extreme development of the instinct of cautiousness. There are many morbid manifestations of it. Sudden fear in sleep, horrible dreams, nightmare, sleep-walking, have been regarded as symptoms of a special disease. Actual terror from irregular circulation in the sensory ganglia; the sense of falling or drowning in cardiac affections; night-

mare from disturbance of the circulation in the larger vessels by repletion, plethora, or position, where a delusion is added to the feeling of apprehension—all are allied, and distinguished by involuntary and excited cautiousness. It is not only, however, when the intelligence may be supposed to be dormant, and the instincts awake, that such exaggerated fears paralyze minds otherwise sane and sound. Murat, 'the bravest of the brave,' and James I. of England, learned if not wise, were subject to vague, uncontrollable panics, which for a time unmanned them. The condition is often found as a consequence and concomitant rather than a cause of disease of the heart. The presence of the *habitual* dread of evil, fear of death, sleepless and breathless anxiety during darkness, or solitude, or silence, as well as the sudden, wild, ungovernable panic, often point to the existence of organic or functional diseases of the heart; and conversely, excited or irregular action of the organ, may lead one to foretell the future appearance of unreasoning fears. Its characteristic is involuntary, irresistible, blind terror, which arises and continues without adequate cause, and is not influenced by reason or religion, nor even by removal of the supposed object of alarm. The disease has appeared epidemically during commercial panics and during the horrors of cholera and plague, and other great scourges. Panophobia may be hereditary, and has been traced through three successive generations.

FEARNLEY, *fėrn'lĭ*, Carl Frederik, Norwegian astronomer: b. Frederikshald 1818, Dec. 19, d. Christiania 1890, Aug. 22. He studied at Bonn and Königsberg, became professor of astronomy at the university at Christiana 1857, director of the observatory 1861 and head of the geodetic survey of Norway 1876. He published: *Zur Theorie der terrestrischen Refraction* (1884); *Zonenbeobachtungen der Sterne zwischen* 64° 50′ *und* 70° 10′ *nördlicher Deklination* (1888).

FEARNLEY, Thomas, Norwegian landscape painter: b. Frederikshald 1802, Dec. 27; d. Munich 1842, Jan. 16. Among his works are: *Copenhagen* (1823); *View of the Marumelf; Justeldas Glacier; Duck Shooting; Romsdalhorn; Grindelwald Glacier; Waterfall and Sawmill; Sorrento; Madumsfall; Castelmare; Moonlight; Gravius Fjord; View in Norway; Labrofos Waterfall.*

FEASIBLE, a. *fē'zĭ-bl* [F. *faisable*, easy—from F. *faire*, L. *făcĕrĕ*, to make or do]: that may be done; practicable. Fea'sibly, ad. *-blĭ*. Fea'sibil'ity, n. *-bĭl'ĭ-tĭ*, the quality of being capable of execution; practicability: also Fea'sibleness, n. *-bl-nĕs*.

FEAST, n. *fēst* [F. *fête;* OF. *feste*—from L. *festum*, a holiday, a feast: It. *festa*]: a plentiful entertainment to several or many guests; a banquet; something delicious to the palate; that which delights the mind; a church festival (see Festivals): V. to eat sumptuously; to entertain with abundant good things; to delight. Feast'ing, imp.: N. the act of eating luxuriously. Feast'ed, pp. Feast'er,

n. one who.—SYN. of 'feast, n.': treat; entertainment; festivity; festival; carousal; holiday; repast.

FEAT, n. *fēt* [F. *fait*, an exploit—from L. *factum*, a thing done]: a daring or bold act; an extraordinary act of strength, skill, or cunning; any exploit: ADJ. in *OE.*, ready; skilful. FEAT'ER, the compar. degree; in *OE.*, neater; nicer: V. in *OE.*, to set an example to; to fashion. FEAT'ED, pp. showed an example FEAT'OUSLY, ad. *-ŭs-lĭ*, in *OE.*, neatly; dexterously. FEATLY, ad. *fēt'lĭ*, in *OE.*, neatly; nimbly.—SYN, of 'feat': act; deed; action; trick.

FEATHER, n. *fĕth'ėr* [AS. *fæther;* Icel. *fiödr;* Dut. *veder*, feathers: Bav. *fledern*, to flutter]: part of the natural covering of a bird; a plume—the whole feathers of a bird are called its *plumage;* kind, nature, or class: V. to dress or adorn with feathers. FEATH'ERING, imp.: N. in *Goth. arch.*, an arrangement of small arcs or foils, separated by projecting points or cusps; a covering of feathers; in *rowing*, the turning of the blade of the oar horizontally as it leaves the water. FEATHERED, pp. *fĕth'ėrd:* ADJ. clothed or covered with feathers; furnished with feathers, as an arrow. FEATHER'LESS, a. having few or no feathers. FEATH'ERY, a. *-ėr-ĭ*, having the appearance of feathers; light as feathers; in *bot.*, having hairs which are themselves hairy. FEATHER-BOARDING, or WEATHER-BOARDING, n. arrangement of boarding in which the edge of one board overlaps a small portion of that next to it. FEATHER-EDGED, made thin at the edges. FEATHER-FEW, n. same as FEVER FEW. FEATHER-FOIL, a wild plant; the water-violet; the *Hottōnĭă inflata* of the United States, and the *Hottōnĭă palus'tris* of Europe, ord. *Primŭlācĕæ:* named from Peter Hotton, Dutch botanist: it grows under water, but sends its blossoms up into the air. FEATHER-SPRING, n. the sear-spring of a gun-lock. FEATHER-STAR, *Comatula rosacea:* a member of the class Echinoderms, order Crinoids. Its body is pentagonal, with 10 slender feathery arms. When young the animal is attached to a stalk; when adult it becomes free. FEATHER-STONE, probably corrupted from *federal stone*, a stone table in the open air at which some judicial proceedings were had, and covenants made. FEATHER-WEIGHT, n. in *racing*, lightest weight allowed to be carried by a horse in a handicap; in *boxing*, *wrestling*, etc., a term applied to the lightest of the classes into which contestants are divided—in contradistinction to *light* weight, *middle* weight, *welter* weight, *heavy* weight, etc. FEATHERING PADDLE-WHEEL, a wheel whose floats have a motion on an axis, so as to descend nearly vertically into the water and ascend the same way, avoiding beating on the water in the descent, and lifting water in the ascent. FEATHERING-PROPELLER, n. an invention in which the vanes of the propeller screw are adjustable, so as even to be turned into the plane of the propeller shaft and offer no resistance when the vessel is under sail and the propeller not used. FEATHERING-SCREW, n. the same as FEATHERING-PRO-

PELLER. A FEATHER IN ONE'S CAP, an honor; a trophy. TO BE IN FULL FEATHER, to make a show; to be in full dress; to be up to the mark in any way. TO BE IN HIGH FEATHER, to be elated. TO SHOW THE WHITE FEATHER, to show signs of cowardice. TO TAR AND FEATHER, to smear with tar, and then cover with feathers. TO FEATHER AN OAR, to turn an oar on leaving the water, so that its blade may pass through the air horizontally, and then through the water vertically. TO FEATHER ONE'S NEST, to amass money, especially from holding an office or place; to make a snug, warm, comfortable home.

FEATHER, *fĕth'ĕr:* river of Cal., feeder of the Sacramento. It flows through one of the richest gold-fields in the state. It receives the Yuba near Marysville, which appears to mark the head of navigation—the distance down the F. and the Sacramento to the harbor of San Francisco being about 100 miles.

FEATH'ER GRASS (*Stipa*): genus of grasses remarkable for the long awns which give a peculiar and very graceful appearance to the species, mostly natives of warm temperate climate. In some the awn is beautifully feathered, as in the best known species, the COMMON F. G. (*S. pennata*), found on dry hills in the middle and south of Europe. It is a perennial, easy of cultivation, and a favorite ornament of gardens. When gathered before the seeds are ripe, its feathery awns—sometimes 12 inches in length—remain attached, so that tufts o F. G. retain their beauty throughout winter. They are often dyed, to give variety to interior decoration, but are never more beautiful than in their natural yellowish-white. The feathery awns not only assist in the diffusion of the seed, which is carried by the wind to great distances, but in a very interesting manner help to fix it in the soil. The seed alights vertically, the furrowed base of the awn becomes twisted, so that its furrows form the threads of a screw, the feathery portion becomes horizontal, the wind acts on it, and the seed is screwed into the ground, and held by barbs. American species are Black Oat Grass (*S. avenacea*) and Porcupine Grass (*S. spartea*), both w. and s.w., awns 3–7 in. long.

Feather Grass (*Stipa pennata*).

FEATH'ERS: complicated modification of the tegumentary system, forming the external covering or plumage of birds, and peculiar to this class of animals. Notwithstanding the varieties of size, strength, and color, all F. are composed of a quill or barrel, *a;* a shaft, *bb;* and a vane, beard, or web, *cc*, on either side of the shaft, the vane consisting of barbs and barbules.

Feather.

The quill by which the feather is attached to the skin is wider but shorter than the shaft, and forms a semi-transparent, horny, cylindrical tube, which terminates below in an obtuse extremity, presenting an orifice termed the lower umbilicus, *e*. A second orifice, leading into the interior of the quill, and termed the upper umbilicus, *f*, is situated at the opposite end, where the two vanes meet and unite. The cavity of the quill contains a series of conical capsules fitted one upon another, and united by a central pedicle; and the whole structure presents a remarkable combination of strength and lightness.

The shaft is always of greater length than the quill, and tapers gradually to its free extremity; it is flattened at the sides, is more or less convex on the back, and presents a longitudinal groove inferiorly. It is composed of white, elastic, spongy structure, covered by a thin horny sheath.

At the point of junction of the shaft and quill,—except on the feathers of the wings and tail—a small supplementary shaft is given off, furnished with barbs or fibres, and termed the plumule or accessory plume. In the ostrich it is altogether absent; in the rhea, it is represented by a tuft of down; in the emu it equals the original feathers in size, so that the quill supports two shafts; and in the cassowary there is a second plumule of considerable size, so that the quill presents three distinct shafts.

The vanes or webs are composed of numerous barbs or small fibres arranged in a single series along each side of the shaft. They are fine prolongations of the outer coat of the shaft, are of flattened form, and lie inclined toward the apex of the feather, with their flat sides toward each other, and their margins in the direction of the external and internal sides of the feather. The barbs are broader near the shaft than at the free apex, and in the large wing-feathers the convexity of one is received into the concavity of another. They are, however, generally kept in position by the barbules, which are minute curved filaments arising from the upper edge of the barb, much as the latter arises from the shaft. There are two sets of these barbules, one curved upward, and the other downward, and hose of one barb hook so firmly into those of the next, as to form a close and compact surface. In the ostrich, the barbules

are well developed, but are loose and separate, and it is this arrangement which gives to the feathers of this bird their soft, plumous appearance.

F. present numerous gradations of structure. In the cassowary, the wings, instead of being provided with ordinary F., are furnished with five cylindrical stalks destitute of barbs, so that there are merely the quill and shaft. On the breast of the wild turkey is a tuft of F. resembling long black hair. In the *Dasylophus Cumingii*, the F. of the crest, breast, and throat are changed, at their extremities, into round, horny lamellæ, looking like shining black spangles; and in the common waxwing or Bohemian chatterer, some of the wing-feathers present at their extremities small horny expansions, resembling red sealing-wax, both in color and consistence.

Besides the common F., the skin of many birds, especially of aquatic species—in which plumules rarely exist—is covered with a thick coating of down, which may be described as consisting of very minute F., each composed of a very small soft tube lying in the skin, from the interior of which arises a minute tuft of soft filaments, without any central shaft. This downy covering secures warmth without weight, like the soft fur at the base of the hair of arctic mammals. In most birds, the skin also bears a good many scattered hair-like appendages, which indicate their relations to the ordinary F. by the presence of a few minute barbs toward the apex.

F. are developed in depressions of the skin, lined by an inversion of the epidermis which surrounds the bulb from which each feather springs; they grow, much in the same manner as hairs, by the addition of new cells from the bulb, which becomes modified into the horny and fibrous stem, and by the elongation of previously existing cells. They are, when first formed, living vascular parts, growing by nutrient vessels; but when they are fully formed, the vessels become atrophied, and the F. become dried up, and gradually die from the summit to the base. For a full account of the development of the different parts, see Prof. Owen's article, 'Aves,' and Prof. Huxley's article, 'Tegumentary Appendages,' in the *Cyclopædia of Anatomy and Physiology*.

F. grow with great rapidity, and in some birds attain a length of more than two ft. They are almost always renewed annually, and in many species oftener; hence it may be conceived how much vital energy must be exhibited in their development, and how critical the period of moulting must be. The plumage is generally changed several times before it attains the state which is regarded as characteristic of the adult bird; these changes may occupy a period usually ranging from one to five years.

Notwithstanding their extravascular nature, F., as is well known, undergo a change of color after they are completely formed. In yearling birds, the winter plumage, which succeeds the autumnal moult, gradually assumes brighter tints, the new color commencing at the part of the vane nearest the body, and gradually extending out-

ward till it pervades the whole feather. Dr. Weinland, an American naturalist, is of opinion, from a comparison of bleached specimens in museums, with recent ones taken from the bird, that the brightness and fading of the colors are due to the increase or diminution of an oily matter. Thus, the microscopic examination of the vane of F. from the breast of a fresh merganser showed numerous *lacunæ* containing a reddish oil-like fluid; some weeks later, the same F. having become nearly white from exposure to light, disclosed air-bubbles instead of the reddish fluid. If this fluid is an actual oil, as is probably the case, it could make its way into the non-vascular tissue by mere physical imbibition; and on the varying quantities of this oil the variations of plumage would depend.

The property possessed by the plumage of most birds, of keeping the surface protected from moisture, is well known. This is due to two causes. Most birds are provided with an oil-gland at the base of the tail, whose secretion is distributed over the F. by means of the bill; and, additionally, the shedding of water is partly due to a thin plate of air entangled by the feathers.

The F. vary in form in different parts of the body, and afford zoological characters for distinction of species. Hence, they have received distinct names, such as primaries, secondaries, tertiaries, etc., in ornithology: see BIRDS.

The chief uses to which F. are applied in the arts are three—*pens*, because of the peculiar elasticity of the barrels; *bed-feathers*, because of the combined softness and elasticity of the barbs; and *ornament*, because of the graceful forms and delicate tints of the whole feather. For the mode of preparing the barrels for pens, see QUILLS.

Bed-feathers were used in England in the time of Henry VII.; but it is not known how much earlier. At present, goose-F. are preferred, the white rather than the gray. What are called *poultry* F., such as those of the turkey, duck, and fowl, are less esteemed, on account of their deficient elasticity. Wild-duck F. are soft and elastic, but contain an oil difficult to remove. The following is one among several modes of preparing F. for beds. Clean water is saturated with quicklime; the F. are put into a tub; the lime-water is added to the depth of a few inches; the F. are well steeped and stirred for three or four days; they are taken out, drained, washed in clean water, dried upon nets, shaken occasionally while drying, and finally beaten to expel any dust. The larger establishments, however, now prepare bed-feathers by steaming, which is found more profitable and efficient. The *down*, which is of so light and exquisite a texture as to have become the symbol of softness, is mostly from the breasts of birds, and forms a warm and delicate stuffing for beds, pillows, and coverlets. The most valuable is that from the eider-duck: see EIDER.

F. used for head-dresses, or other purposes of ornament, are selected for their forms and colors. The *ostrich*, a very valuable kind of feather, is an example of the way in which ornamental F. generally are prepared by the *plu-*

massier. The hunters endeavor to avoid injuring the feathers by blood or blows: see OSTRICH. The feathers are assorted according to quality; those from the back and above the wings are best, the wing feathers next best, and the tail feathers least valued. The feathers of the male are rather more prized than those of the female. They are cleaned for use by repeated soakings and washings in water, sometimes with and sometimes without soap. There is also a process of bleaching by means of burning sulphur. When dried by being hung upon cords, the feathers pass into the hands of the dresser, who opens the fibres by shaking, gives pliancy to the ribs by scraping them with bits of glass, and curls the filaments by passing the edge of a blunt knife over them. If the feathers, whether of the ostrich or any other bird, remain in the natural color, little more has to be done; but if a change of tint be required, the feathers easily take dye-materials—such as safflower and lemon-juice for rose-color or pink. Brazilwood for deep red, Brazil-wood and cudbear for crimson, indigo for blue, turmeric or weld for yellow, etc. A process of bleaching is adopted before the dyeing, except for black.

The kinds of feathers chiefly used for ornament are those of the ostrich, adjutant, rhea or American ostrich, emu, osprey, egrett, heron, antrenga, bird of paradise, swan, turkey, peacock, argus pheasant, ibis, eagle, and grebe. White ostrich feathers are prepared chiefly for ladies' head-dresses; and black for some military and some funereal trappings. The white and gray marabout-stork feathers, imported from Calcutta, are beautifully soft and light, and are in request for head-dresses, muffs, and boas; the white kinds will sometimes sell for their weight in gold. The flossy kinds of rhea feather are used for military plumes, and the long brown wing feathers for brooms and brushes. Osprey and egrett feathers are used mostly for military plumes by Hussar troopers. Bird of Paradise feathers are much sought by oriental princes for turban-plumes. Cocks' feathers are used for ladies' riding hats and for military plumes. Dr. Macgowan, U. S. consul at Ningpo a few years ago, described, in the *American Journal of Science and Art*, an ingenious process which the Chinese adopt for combining brilliant-colored feathers with bits of colored metal into garlands, chaplets, frontals, tiaras, and other ornamental articles.

FEATURE, n. *fē'tūr* or *-chûr* [It. *fattura;* OF. *faicture*, the making or workmanship of a thing—from L. *factura*, a making: Norm. F. *faitura*, fashion, make—connected with *feat—lit.*, the make or workmanship of a thing]: the make, form, or cast of any part of the face; any single lineament; outline; prominent parts; outward appearance. FEA'TURED, a. *-tūrd*, having features. FEA'TURELESS, a. without features.

FEAZE, v. *fēz* [AS. *fæs*, a fringe; Ger. *fasen*, to ravel out]: to untwist the end of a rope; to unravel.

FEBIGER, *fĕb′ĭ-gėr*, CHRISTIAN: 1746–1796, Sep. 20; b. island of Fünen, Denmark: soldier. He received a military education, served on the staff of his uncle when gov. of Santa Cruz, travelled through the American colonies 1772, engaged in commercial business in New England, was adjutant of a Mass. regt. at Bunker Hill, was taken prisoner while serving under Arnold in the Quebec campaign, 1775, Dec. 31; became lieut.col. of a Virginia regt. 1776, Nov., took part in the Pennsylvania campaign, and was promoted col. for gallantry at Brandywine. At Germantown he commanded the right of Greene's wing, at Monmouth led a force of 4,000 men and two guns, and at Stony Point commanded the right column and personally captured the British commander. He retired from active service after Cornwallis's surrender, was brevetted brigadier-general 1783, Sep. 30, and was treasurer of Pennsylvania from 1789, Nov. 13, till death.

FEBRILE, a. *fē′brĭl* or *fĕb′* [Fr. *fébrile*, pert. to a fever—from L. *febrīlĭs*—from *febris*, a fever]: pertaining to a fever; indicating fever; feverish. FEBRICULA, n. *fĕb-rĭk′-ū-lă* [L.]: a slight fever, called sometimes Ephemera (fever of a day): see FEVER.—FEB′RIFUGE, n. *-rĭ-fūg* [L. *febris; fŭgō*, I drive away]: any remedy that mitigates or removes a fever (q.v.). FEBRIS, n. *fē′brĭs* [L.]: fever.

FEBRONIANISM, *fē-brō′nĭ-an-ĭzm:* in Rom. Cath. theology, a system of doctrine antagonistic to the admitted claims of the Roman pontiff, and asserting the independence of national churches, and the diocesan rights of individual bishops in matters of local discipline and church government. The name is derived from the *nom de guerre*, Justinus 'Febronius,' assumed by John Nicholas von Hontheim, coadjutor archbishop of Treves, in a work on these subjects, entitled *De Præsenti Statu Ecclesiæ*, which he published 1767, and which, with its several successive volumes, led to a violent and protracted controversy, and elicited the severest censures of the Roman tribunals. See HONTHEIM: GALLICAN CHURCH.

FEBRUARY, n. *fĕb′rô-ėr-ĭ* [L. *Febrŭārĭŭs*, the month of expiation—from *febrŭŭm*, an expiation]: second month of the year; having ordinarily 28 days, but in leap-year having an additional or intercalary day. Among the Romans, it had originally 29 days in an ordinary year, but when the senate decreed that the eighth month should bear the name of Augustus, a day was taken from February, and given to August, which had then only 30, that it might not be inferior to July. The name is derived from the fact that during this month occurred the Roman festival called the Lupercalia, and also Februalia, from *februare*, to purify.

FEBRUUS, *fĕb′rū-ŭs* [connected with Lat. *februare*, to purify]: ancient Italian divinity, whose worship was celebrated with lustrations during the month of February. The ceremonies instituted in his honor were believed to have the effect of producing fertility in man and beast. Februus, whose name in the Etruscan language is said to

have signified god of the lower world, was also worshipped as such by the Romans, and identified with the Greek Pluto.

FECAMP, *fā-kŏng′:* manufacturing town and seaport of France, dept. of Seine Inférieure, in a narrow valley, flanked on either side by steep cliffs, at the mouth of a stream named Fecamp, same name on the English Channel, 23 m. n.e. of Havre. It consists mainly of one long street. Its principal building is the handsome church of Notre Dame, in the early pointed style, dating from the 14th c. The harbor is frequented by colliers from Newcastle and Sunderland, and by Baltic timber-ships and fishing-vessels. Fecamp has cotton-mills, sugar-refineries, tanneries, ship-building yards, and some linen-cloth and hardware manufactures. Pop. 12,000.

FECES, FECAL, etc.: see Fæces.

FECHNER, Gustav Theodor, a German scientist and philosopher of great originality and versatility: b. Gross-Saerchen in Nieder-Lausitz, 1801, April 19; d. Leipzig, 1887, Nov. 18. He was schooled at Sorau and Dresden, and graduated in medicine from the University of Leipzig where he later (1834) occupied the chair of physics. He published works on philosophy, psychology, æsthetics, physics, chemistry, physiological optics, and statistics; critical essays in art and literature, humorous satires, and riddles in rhyme for children. With his *Elemente der Psychophysik* (2 vols. 1860) and his *Vorschule der Æsthetik* (2 vols. 1876), he founded respectively experimental psychology and experimental æsthetics. His *Nanna* (1848) and *Zend Avesta* (1851) contain his philosophy, which has but little connection with traditional philosophic systems. The most salient feature of his genius lay in applying experiment to problems deemed wholly speculative. Taken all in all he may be regarded as one of the most creative intellects of the 19th c. In the latter part of his career he lectured chiefly on philosophical and psychological subjects.

FECHNER'S LAW: see Psychophysics.

FECHTER, *fĕsh′tėr*, Charles Albert: actor of eminence: abt. 1823–1879, Aug.; b. London; son of a Frenchman. When only three or four years old, he went with his parents to France, and was educated as a sculptor; but his predilections were for the stage; and he soon became a popular actor. In 1860 he was announced to appear in an English version of *Ruy Blas* at the Princess's, London, and so perfectly identified himself with the character, that people almost forgot his French accent, in admiring the energy and finish of his acting. In the following year, Mar. 20, he appeared in the character of Hamlet. While abandoning the traditions of the English stage, Fechter showed himself capable of appreciating the difficulties that he had to contend with, and in some measure of surmounting them. The impersonation was, on the whole, one that

marked him as an actor of very high powers. The same may be said of his representation of Othello. Subsequently Fechter became lessee of the Lyceum Theatre, playing the chief part in most of the pieces produced. In 1870 he made a successful visit to the United States, where he thence forward remained, and where he died.

FECIAL, a. *fē'shal* [L. *fetialis*, a public officer employed in the declaration of war]: of or pertaining to the Fecials: N. in *Rom. antiq.*, one of a college of 20 priests, said to have been instituted by Numa, who presided over all the ceremonies connected with the ratification of peace or the formal declaration of war.

FECIT, v. *fē'sĭt* [L. he did it or made it]: a word inscribed on the work of a painter or sculptor after his name to indicate that 'he did it' or 'he made it'.

FECKLESS, a. *fĕk'lĕs* [Scot. *feck*, worth, power, value]: in *Scot.* and *OE.*, powerless; of no account; worthless.

FECULA, or FÆCULA, n. *fĕk'ū-lă* [L. *fæcŭlă*, salt of tartar deposited from wine—from *fæx*, dregs or sediment: F. *fécule*]: starchy powder obtained in great abundance from plants and their seeds, etc., by crushing and washing them, and allowing the matter to settle; starch—in France usually potato-starch (see STARCH): farina—also called *amylum*. FEC'ULENT, a. *-lĕnt* [F.—L.]; muddy; foul; abounding with sediment. FEC'ULENCE, n. *-lĕns*, or FEC'ULENCY, n. *-lĕn-sĭ*, the state or quality of being feculent; muddiness; sediment.

FECUND, a. *fĕk'ŭnd* [L. *fēcŭndŭs*, apt to bear young, fruitful: It. *fecondo:* F. *fécond*]: fruitful; prolific. FEC'UNDATE, v. *-ŭn-dāt*, to make fruitful. FEC'UNDATING, imp. FEC'UNDATED, pp. FEC'UNDA'TION, n. *-dā'shŭn*, the act of making fruitful, or prolific; impregnation. FECUNDITY, n. *fĕ-kŭn'dĭ-tĭ* [OF. *fecondité*—from L. *fecundĭtātem*, fruitfulness]: fruitfulness; the power of producing or bringing forth.

FECUNDA'TION, or FERTILIZA'TION, in Plants: reproductive process according to laws similar to those which prevail in the animal kingdom. In plants, however, the organs of reproduction are not permanent as in animals, but fall off—the male organs generally soon after fecundation, the female after the ripening of the seed. The male seminal substance, called *pollen*, never exists in a fluid state but always in that of granules of various forms (*pollen grains*), which consist each of one cell, whose covering is of various thickness, and contains the impregnating substance. After the dehiscence of the anthers, the pollen comes into contact with the stigma of the pistil, which in its lowest and thickest part (the *ovary* or *germen*) contains the rudiments of the future seeds (*ovules*). The inner layer of the cell-covering of the pollen grain separates from the outer and thicker layer, as if it came out of a bag, and continuing to be elongated by growth, is carried down through the *style* to the germen, where it reaches the *fora-*

men or small opening of the embryo sac, and comes into contact with the ovule, or even in many cases penetrates into the ovule itself between its cells. By this time, one or other of the cells of the ovule has become considerably more enlarged than the other cells, and what is called the *amnion* has been formed, in the mucilaginous fluid of which (*protoplasma*), after the contact of the pollen bag, through the dynamic operation of its contents, a *cell-germ* or *cytoblast* is soon developed. This cytoblast is the first commencement of a new and distinct cell, which divides into two cells. These increase, by continually repeated separation of new cells, into a cellular body, which forms the more or less perfect *embryo* of a new plant. If the organ from which the pollen has proceeded, and the organ which contained the ovule, belong to the same plant or to plants of the same species, the embryo arising from this fecundation becomes a plant of the same species. But if the pollen by which the fecundation is effected comes from a plant of another species than that to which the plant belongs in whose germen the embryo is formed, the seed resulting from this fecundation will not, when it grows, produce plants of the same species, but *hybrids*, intermediate between the parent plants, and with various degrees of resemblance to one or other of them, but not perfectly corresponding with either. Hence the production of hybrids, and multiplication of varieties of plants in gardens, by what is called the artificial impregnation of the stigma of one plant with the pollen of another, which, however, must be of an allied species, hybridization being confined by the laws of nature within very narrow limits. See REPRODUCTION: PLANT: STAMEN: PISTIL: VEGETABLE PHYSIOLOGY.

FED, v. *fĕd:* pt. and pp. of FEED, which see.

FEDERAL, a. *fĕd'ėr-ăl* [F. *fėdéral*—from L. *fœdĕrālĭs*—from L. *fœdus*, a league or treaty]: pertaining to a league; consisting in a compact or agreement between nations or between the several states of a nation, as in Switzerland or the United States: N. an advocate of the strengthening of the central government. FEDERACY, n. a confederation or union of several states under one central authority, consisting of delegates from each state, in matters of general polity. FED'ERALISM, n. *-ĭzm*, the principles of the federals. FED'ERALIST, n. a supporter of federalism; a federal. FED'ERALIZE, v. *-īz*, to league together. FED'ERALI'ZING, imp. FED'ERALIZED, pp. *-īzd*. FED'ERATE, a. *-āt*, united by compact. FED'ERA'TION, n. *-ā'shŭn* [F.—L.]: the act of uniting in a league; a league; a union for purposes of government. FED'ERATIVE, a. *-ā-tĭv*, joining in a league or contract; forming a confederacy.

FEDERAL GOVERNMENT: the system of government in which the powers of government are distributed by a written instrument between a central or national government, usually called the federal government, and various local bodies, usually called states. Such a system

may be either a Confederation, properly so-called, or a real federal government in the strict sense of the words. When several states, otherwise independent, bind themselves together by a treaty, so as to present to the external world the aspect of a single state, without renouncing their individual powers of strictly internal self-government, they are said to form a Federation or Confederation. The contracting parties are sovereign states acting through their representatives; and the extent to which the central overrules the local legislatures is fixed by the terms of the treaty. In such degree or extent as the governmental authority of the several states is reduced, and the central power is given direct power to govern individuals within the limits of the federated states, the federation approaches to the character of a seal federal system of government. The only renunciation of power which a Confederation as such necessarily implies, consists in abandoning the right, so long as the Confederation lasts, which each separate state otherwise would possess of forming or conducting relations with foreign states. 'There are,' says Mr. Mill, 'two different modes of organizing a federal union. The federal authorities may represent the government solely, and their acts may be obligatory only on the governments as such, or they may have the power of enacting laws and issuing orders which are binding directly on individual citizens. The former is the plan of the German so-called confederation, and of the Swiss constitution previous to 1847. It was tried in America for a few years immediately following the war of independence. The other principle is that of the existing constitution of the United States, and was adopted by Switzerland at the revision of the constitution 1874. The federal congress of the American Union is a substantive part of the government of every individual state. Within the limits of its attributions, it makes laws which are obeyed by every citizen individually, executes them through its own officers, and enforces them by its own tribunals. This is the only principle which has been found, or which is even likely to produce an effective federal government. A union between the governments only is a mere alliance, and subject to all the contingencies which render alliances precarious.'—*Representative Government*, pp. 301, 302. This latter principle is now also at the basis of the present German Empire which succeeded the German Confederation referred to by Mill. Inasmuch as a real federal system is usually an outgrowth of a previous confederation, there is usually a conflict over the question of the real character of the new system, one view being that it is still merely an alliance between independent sovereign states, based upon a treaty; the other that the constitution is not a treaty but a fundamental law resting in fact upon the will of the people of the whole country considered as a unit. It took the civil war to settle this question in the U. S. in favor of the latter view. (See

CONFEDERATION; CONFEDERATION OF THE THIRTEEN AMERICAN COLONIES.) One of the chief difficulties which arise in organizing a federal government, consists in discovering by what means questions as to the limits of the respective powers of the central and local governments are to be disposed of. The arrangement by which this object is effected in America, of which M. de Tocqueville expressed his admiration, is thus explained by Mill. Under the more perfect mode of federation, where every citizen of each particular state owes obedience to two governments—that of his own state, and that of the federation—it is evidently necessary not only that the constitutional limits of the authority of each should be precisely and clearly defined, but that the power to decide between them at any case of dispute should not reside in either of the governments, or in any functionary subject to it, but in an umpire independent of both. There must be a supreme court of justice, and a system of subordinate courts in every state of the union, before whom such questions shall be carried, and whose judgment on them, in the last stage of appeal, shall be final. Every state of the union, and the federal government itself, as well as every functionary of each, must be liable to be sued in those courts for exceeding their powers, or for non-performance of their federal duties, and must in general be obliged to employ those courts as the instrument for enforcing their federal rights. This involves the remarkable consequence, actually realized in the United States, that a court of justice, the highest federal tribunal, is Supreme over the various governments, both state and federal, having the right to declare that any new law made, or act done by them, exceeds the powers assigned to them by the federal constitution and, in consequence, has no legal validity.'—(p. 305). Mr. Mill's statement, however, is not entirely accurate. Neither the federal government nor any state may, as such, be sued without its consent by a private person, either in the federal or state courts. Moreover, in other federal systems, notably Switzerland and Germany, the courts do not have the power to pass on the constitutionality of federal statutes, so that such a system is not 'evidently necessary', though it may be advisable.

FEDERALIST, *fĕd'ĕr-al-ĭst*, THE: collection of 86 essays written anonymously over a common signature, *Publius*, by Alexander Hamilton, James Madison, and John Jay, and addressed to the 'People of the State of New York.' The purpose of the essays was to secure the adhesion of N. Y. to the federal constitution proposed by the convention of 1787, Sep. 17, and excepting the last 9 all were published in *The Independent Journal*, semi-weekly newspaper of New York, 1787, Oct. 27–1788, Apr. 2. The essays were first published in book form, 2 vols. 12mo, 1788, and have been republished many times. A peculiar historical value is attached to the collection, as they are held to pre-

sent most fully the views of the framers of the constitution on the necessities of the day and the requirements of the government in the future. Much curious speculation has been indulged concerning the authorship of the several essays.

FEDERALISTS: see Political Parties.

FEDERAL THEOLOGY: system resulting from endeavors to compress Christian doctrine within the limits of certain covenants conceived of as made between God and man, and between the Father and the Son in the Eternal Godhead: see Covenant, in theology.

FEE, n. *fē* [AS.*feoh;* Icel. *fe*, cattle, money: Dut. *vee*, cattle: Goth. *faihu*, cattle, property—connected with *fief* and *feudal*]: price paid for service—usually said of professional men; reward or recompense; any land or tenement held of a superior on certain conditions: V. to pay a fee to; to engage in one's service; to hire. Fee'ing, imp. retaining by a fee; in *Scot.*, hiring for service. Feed, pp. *fēd*, retained by a fee, as a lawyer. Feer, n. *fē'ėr*, one who holds a fee, or in fee, as an estate or property. Retaining-fee, the fee paid to a lawyer to secure his services. Fee-farm, land held by the payment of rent. Fee-simple, an estate in lands or tenements of which the owner has the fullest power of disposing which the law allows (see Fee, Estate in). Fee-tail, a limited inheritance; an estate handed down by entail (q.v.). Fee and Life'rent, in the *law of Scotland*, the first the full right of proprietorship, the second the limited right of usefruct during life. These may be held together, or may coexist in different persons at the same time.

FEE, Estate in: largest estate in land in point of quantity of estate known to the law of England, being a freehold (q.v.) of inheritance. Estates in fee are divided into fee-simple and fee-tail. A fee-simple is defined by Littleton (1. a) to be a lawful and pure inheritance. In order to create an estate in fee-simple by deed, it is necessary that the word heirs should be used; for a gift by deed to a man for ever, or to a man and his assigns for ever, creates only an estate for life. But words of perpetuity annexed to a gift to a man by will are construed as carrying an estate in fee. The proprietor of an estate in fee-simple enjoys the fullest rights of property over his estate, which he may alienate or burden at pleasure, and out of which he may grant estates of a lower kind, as for life or years. He is owner of the soil '*a cælo usque ad centrum*,' and is therefore entitled to every product of the land, as timber, etc., and to all minerals and other valuable productions found beneath the surface. On his death, the estate descends to his right heirs, except in the case of fees held by corporations, which descend to their successors in office. Where a man claims an estate in fee-simple in possession in a corporeal hereditament (q.v.), he is said to be 'seized in his demesne as of fee.' Estates in fee-simple are divided into fee-simple absolute, qualified or base, and

conditional. A qualified or base differs fee from a fee-simple absolute by having a qualification annexed which may determine the estate, as where it is granted to a man and his heirs 'tenants of the manor of Dale.' If, therefore, at any time the holder of the estate ceases to be the tenant of Dale, the estate, which depended on that qualification, determines.

A *conditional fee* was limited to a particular class of heirs, to the exclusion of others, as to a man and the heirs-male of his body. On failure of heirs-male of the body of the grantee, an estate of this kind reverted to the grantor or his heirs. In interpreting this law confusion arose, and by the famous statute *De Donis Conditionalibus* (13 Ed. I. c. 1), it was enacted that estates should be held *secundum formam doni*. Estates created by this statute were called estates in *fee-tail*. See ENTAIL.

The original mode of transferring an estate in fee was by feoffment (q.v.), but the statute of Frauds (29 Char. II. c. 3) requiring that writing should be used in all transfers of land, estates in fee must now be conveyed by deed or will.

The proprietor of an estate in fee-simple in the present day is substantially absolute owner of the freehold, which he holds without owing duty or service to any one, except the allegiance due to the sovereign, or civil power. But originally this was not so; an estate in fee is in its nature a feudal benefice, a feud, and the owner of the fee held his estate subject to all the services incident to the feudal state. But these duties, which never existed in the United States, have been by degrees entirely abolished in England: see FEUDAL SYSTEM: TENURES. In Scotland, the feudal usages in regard to land are still retained to a very great extent. An estate in fee in Scotland must be held by one of the three existing tenures—viz., feu, blanch, or burgage, and is subject to the casualties (q.v.) attaching to these rights.

FEEBLE, a. *fē′bl* [OF. *fleble* and *foible;* F. *faible*, weak: It. *fievole*, feeble—from mid. L. *flebĭlĭs*, infirm]: deficient in energy; weak; infirm; faint; imperfect; slender: V. in *OE.*, to enfeeble; to make weak. FEEBLED, pp. *fē′bld*, made weak. FEE′BLY, ad. *-blĭ*, in a feeble manner; weakly. FEE′BLENESS, n. *-bl-nĕs*, want of strength. FEEBLE-MINDED, weak of mind; wanting in resolution.

FEED, n. *fēd* [AS. *fedan*, to feed, to bring up: Sw. *fœda;* Dan. *föde*, to feed, to give birth to: comp. Gael. *fiadh*, meat, food (see FOOD)]: a certain quantity of food eaten at one time; a certain allowance of food given at one time, as to a horse or cow: V. to supply with food; to furnish with a supply of anything constantly required; to nourish; to keep in hope; to take food; to pasture or graze. FEED′ING, imp. N. act of eating or giving food to; pasture. FED, pt. and pp. *fĕd*, furnished with food; nourished. FEED-CLOTH, n. in *fibre*, the apron which leads the cotton, wool, or other fibre into the cleaning, lapping, carding, spinning, or other machine. FEED-CUTTER, a machine for cutting straw,

hay, or cornstalks into short feed or chaff. FEED-HAND, n. in *gear.*, a rod by which intermittent rotation is imparted to a ratchet-wheel. FEED-HEAD, in *steam-eng.*, a cistern containing water and communicating with the boiler of a steam-engine by a pipe, to supply the water by gravity, the height being made sufficient to overcome the pressure within the boiler. FEED-HEATER, in *steam*, a drum or chamber in which feed-water for the boiler is heated by the exhaust steam. FEED-MOTION, contrivance in a machine by which the material under treatment is advanced or fed to the machine. FEED-PUMP, a force-pump driven by hand, or by donkey-engine, or by the engine itself, for supplying to the boiler a quantity of water equal to that removed in the form of steam. FEED-SCREW, in *turn.*, a long screw employed to impart a regular motion to a tool-rest or to the work, as the feed-screw in the bed of a lathe, which moves the screw-cutting tool. FEED-WHEEL, a continuously or intermittingly revolving wheel or disk which carries forward an object or material. FEED OF A LOCK, in *hydraul. eng.*, the amount of water required to pass a boat through a canal lock. FEED'ER, n. he or that which feeds or supplies, in *OE.*, promoter or encourager; one who eats.—SYN. of 'feed, v.', to cherish; foster; nurture, supply; satisfy; graze; prey; pasture.

FEEDER: any main wire carrying current to a group of lamps or motors.

FEEJEE: see FIJI.

FEEL, v. *fēl* [AS. *felan;* Ger. *fühlen;* Dut. *voelen*, to feel: Icel. *fialla*, to touch softly with the palm of the hand]: to perceive or search after by the touch; to experience; to try; to suffer or enjoy; to be affected by; to have the sensibility excited, to have the passions moved: N. sense of feeling; touch. FEEL'ING. imp. ADJ. expressive of great sensibility; easily affected or moved: N. sense of touch perception; emotion; tenderness or sensibility of mind (see EMOTION). FELT, pt. and pp. *fĕlt*, perceived; be affected by. FEEL'ER, n. he or that which feels. FEEL'ERS, n. plu. *-ẽrz*, any long sensitive organs, like the antennæ of insects or the whiskers of a cat. FEEL'INGS, n. plu. nice sensibilities. FEEL'INGLY, ad. *-lĭ*, tenderly; in a manner to be sensibly felt. TO FEEL AFTER, to search for; to seek for in order to find.—SYN. of 'feeling': sensation; susceptibility; sense; passion; consciousness; sentiment; opinion; agitation.

FEELING, in Psychology: the term Feeling has had a number of different meanings in psychological terminology as well as in common language. It was formerly employed to designate sensations of contact, as when we say we feel a glove upon the hand. It has often been used to designate loosely any condition of mental excitement or emotion. It has also been used to indicate conditions of intellectual conviction or apprehension, as when it is said, 'I feel that this must be true.' The generally prevailing usage at present confines the term to those

phases of consciousness which reflect our personal mental attitude toward the object of thought. Feeling represents, primarily, our subjective condition. This meaning can be best made clear by comparing it with the meaning of cognition. We *perceive* or *cognize* a picture, but we *feel* pleased with it. The pleasure represents our attitude toward the object, whereas the cognitive part of the process represents the object itself. Feeling and cognition are thus not two different states of mind, but rather two different aspects of one and the same state. A common psychological doctrine maintains that volition and all controlled action are dependent upon the incentives furnished by feeling. Did we not *feel* a preference for this object and a distaste for that, there would be no ground for our choosing the one and rejecting the other.

Modern theories are at variance regarding the elementary forms of the feeling process. An old and common view maintains that pleasantness and unpleasantness are the two rudimentary forms of feeling, representing the two fundamentally opposed mental attitudes of acceptance and rejection. There is divergence of opinion again as to whether pleasure or pleasantness is always qualitatively of the same kind, differing only on different occasions in intensity or degree. Certain authorities maintain that the qualities of pleasantness and unpleasantness are indefinitely numerous. Others hold to a single pair of antithetic qualities differing only in degree and as regards the other mental elements with which they are combined. The German psychologist Wundt has recently urged the addition of two new pairs of elementary forms of feeling; i.e., strain and relaxation, excitement and quiet. The American psychologist Royce has adopted the second of these groups. On the whole there has as yet been little disposition on the part of other psychologists to accept these new classifications. See Emotion.

FEER, or Fier, v. *fēr* [AS. *fyrian*, to make a furrow]: in *Scot.*, to mark out the breadth of ridges with the plow. Feer'ing, imp. and n. Feered, pp. *fērd*.

FEER, or Fere, n. *fēr* [AS. *gefera*, a companion: Gael. *fear*, a man, a husband: L. *vir*, a man]: in *OE.*, one who *fares*, or goes with another; in *Scot.* and *OE.*, a companion; a wife; a lover. In feer, together; in company.

FEER-HERZOG, Karl, Swiss statesman: b. Rixheim, Alsace, 1820, Oct. 2; d. Aarau 1880, Jan. 16. He became a member of the Grand Council 1852 and was twice its president. In 1865 he was made Swiss representative in the Latin Monetary Union, which position he held for the rest of his life. He was director of the Swiss department of the Paris Exposition 1867, and for many years was president of the Swiss Financial Commission. Among his works are: *Unification monétaire international* (1869); *La France et ses allies monétaires* (1870); *Gold oder Silber?* the latter in German (1874).

FEES, of Lawyers and Physicians. In England, neither barristers nor physicians could recover their fees by legal

proceedings against their clients or patients, except under a special contract. The ground of this rule was that such fees are regarded not as payment, but as an expression of gratitude for services the value of which cannot be appreciated in money, and for which a certain sum cannot be demanded without wrong to the claimant's reputation. The origin of the rule in the case of advocates (in regard to whom it is still in force), is traced to the relation between patrons and their clients in ancient Rome. When the former appeared as the defenders of the latter, they practiced, as Blackstone says (iii. 29, Kerr's ed.), *gratis*, for honor merely, or at the most for the sake of gaining influence. The rule at Rome was maintained even under the emperors; and Tacitus mentions (*Ann.* lib. ii. c. 5) that it was directed by a decree of the senate that these *honoraria* should not in any case exceed 10,000 sesterces, or about £80 of English money. It has further been decided in England, that no action lies to recover back a fee given to a barrister to argue a cause which he did not attend (Peake, 122). But special pleaders, equity draftsmen, and conveyancers, who have taken out certificates to practice under the bar, and therefore are not counsel, may recover their reasonable charges for business done by them (Poucher *v.* Norman, 3 B and C., 744). Another rule with reference to the fees of barristers and advocates is, that they are paid before they are earned; thus removing from legal practitioners all pecuniary interest in the issue of suits.—As regards physicians, the rule that a fee could not be recovered by an action at law, was applied in the case of Chorley *v.* Bolcot, 1791, June 30 (4 T. R. 317). If, however, either a barrister or a physician acted under a special agreement or promise of a certain payment, then an action might be brought for the money. But all medical practitioners were relieved from the above code of honor by the act of 21 and 22 Vict. 90, which applied to the United Kingdom, and enabled them to recover in any court of law their reasonable charges as well as costs of medicines and medical appliances used. This rule applies to physicians, surgeons, and apothecaries as defined by the statute. Members of the inferior branches of both professions—attorneys, solicitors, etc., on the one hand, and surgeons, dentists, cuppers, and the like on the other—were always entitled to raise action for their fees. In Scotland, the same rules prevail as in England with reference to both professions. In France, though the delicate sense of honor of the bar has always been preserved with quite as much care as in England, the rule is somewhat different. In law, an action for the recovery of fees would be maintainable in that country by an advocate; but 'in Paris, the rule of the ancient bar, founded on the disinterestedness which was its characteristic, and according to which any judicial demand of payment of fees was strictly forbidden under pain of erasure from the table (of advocates), has been religiously preserved.'—*History of the French Bar*, by Robert Jones, 1855. The practice in France

seems to be for the fees of advocates to be paid afterward, though any bargain with the client or his agent that their amount shall depend on the issue of a trial, is regarded as dishonorable; and on several occasions the bar has vehemently resisted regulations, calling on them to acknowledge receipt of their fees, as wounding their sensibility.

In the United States, all practitioners of the healing art, who have duly complied with the laws in respect to license, registration, etc., whether physicians, surgeons or apothecaries, can sue for their fees. The view that a physician's services are purely honorary does not, and never did prevail. In the absence of a specific agreement as to the amount of compensation, the physician will be entitled to what is termed a 'reasonable' fee. This means such just and fair pay as is charged for similar services by other physicians of like standing and capacity. If prior dealings have taken place between the parties and no new agreement is made in respect to fees, the former rate is presumed to continue.

In respect to lawyers, the English distinctions between barristers and attorneys do not exist. All members of the profession stand upon the same legal footing. Neither law nor custom forbids an American lawyer from suing for his charges. As in the case of physicians, such charges, where no agreement has been made regulating them, must be reasonable and proportioned to services actually rendered.

FEFT, v. *fĕft*, for INFEFT [see ENFEOFF]: in *Scot.* and *OE.*, for *enfeoffed;* to put in possession of a property with the legal formalities.

FEHÉRVÁR (SZÉKES)—the Latin *Alba Regia,* German *Stuhlweissenburg:* one of the most ancient royal free towns of Hungary; in a marshy district about 40 m. s.w. of Pesth. Under the Arpádian kings, it was the metropolis of the realm, and the residence of the sovereigns, many of whom have been crowned and buried there. It is the seat of a bishop, and its people are chiefly Rom. Catholics, and all of the Magyar race. Water is supplied by an artesian well. Pop. (1880) 25,012.

FEHLING'S SOLUTION, *fā'lĕngz,* a solution much used by chemists for the detection and estimation of glucose and certain other sugars. In its preparation, 34.64 grams of pure sulphate of copper crystals are dissolved in 200 grams of distilled water, and (separately) 173 grams of crystallized neutral tartrate of sodium are also dissolved in 500 or 600 grams of a solution of caustic soda having a specific gravity of 1.12. The copper solution is then gradually added to the caustic soda solution, and the mixed liquid is diluted to one litre. Fehling's solution must be freshly prepared, for, like all other copper test solutions, it becomes unreliable in a short time, thereafter indicating sugar where none exists. For use, a small quantity of the solution is placed in a test tube and diluted with about four times its bulk of water. It is then boiled

for a few seconds, and if it remains clear, it may be considered to be in good condition. The fluid to be tested is then immediately added, drop by drop, until a bulk equal to that of the diluted test fluid has been added. If glucose is present a yellow precipitate of hydrated cuprous oxid is thrown down, which subsequently loses its water of hydration and becomes reduced to ordinary red cuprous oxid. Fehling's Solution is a deep blue in color and in testing a complicated organic fluid (such as urine) for glucose it often happens that the test solution is decolorized even when no glucose is present. It is, therefore, important to observe whether or not an actual precipitate is formed, as mere decolorization is not a sufficient indication.

FEHMIC COURTS, or FEHMGERICHTE: see FEMGERICHTE.

FEIA, *fā-ē′a:* large lake of Brazil, on the maritime border of the province of Rio Janeiro, 150 m. n.e., from the city of Rio Janeiro. It is so near the Atlantic that it has been connected with it by a canal. Feia is about a degree n. of the southern tropic.

FEIGN, v. *fān* [F. *feindre*; OF. *feigner*, to dissemble—from L. *fingĕrĕ*, to form, to contrive—*lit.*, to form, contrive, or invent]: to make a show of doing; to assume or pretend; in *OE.*, to relate falsely. FEIGN′ING, imp. inventing; pretending: N. a false appearance; an artful contrivance. FEIGNED, pp. *fānd*. FEIGN′ER, one who. FEIGN′EDLY, ad. *-ĕd-lĭ*, in pretense; not really. FEINT, n. *fānt* [F. *feinte*, a pretense]: a pretense; a false appearance; a mock attack; the appearance of aiming at or offering when something quite different is intended. FEIGNED-ISSUE, n. in *law*, proceeding in law whereby an action is supposed to be brought by consent of the parties, to determine some disputed right, without the formality or expense of pleading.—SYN. of 'feign': to simulate, dissimulate; imagine; contrive; represent; counterfeit; dissemble; conceal.

FEIGN′ING OF DISEASE′: practiced somewhat in the army and navy, also by convicts and others anxious to escape from discipline, or procure a discharge from compulsory service. In the army, it is technically called *malingering*. The detection of feigned disease belongs to the educated physician, and is impossible, without a thorough knowledge of the reality, unless, indeed, the imitation be very coarse. The diseases most frequently simulated are epilepsy, catalepsy, convulsions, blindness, deafness, palsy, insanity, indigestion, neuralgia, rheumatism, palpitation of the heart, and generally all disorders which may exist without leading to any distinct external appearances. Ulcers of the legs, however, have often been made, and kept open artificially through the application of irritant substances; and vomiting or coughing up of blood is very easily simulated, if the supposed patient can get access to the necessary materials in the slaughter-house or elsewhere. Many

men in the public services, and women affected with hysteria, have become so expert as to deceive even men of high character and skill. An instance is on record in which a man submitted to successive amputations of the arm upward, nearly to the shoulder, for an ulcer produced and kept open at will by local applications; and a case was some time ago recorded by Dr. Murchison in the *Medico-chirurgical Transactions*, in which there is no reasonable doubt that a large opening into the stomach was the result of caustic substances deliberately applied to the abdomen, with the view of exciting sympathy.

FEITH, *fīt*, Rhijnvis: 1753, Feb. 7—1824, Feb. 8; b. Zwoll, in Overyssel: Dutch poet, ranking next to Bilderdijk (q.v.) as a reviver of the national poetry. He studied law at Leyden, and returned to his native town 1776, where he held the office of burgomaster. Feith tried almost all kinds of poetry. In his earlier productions, he showed excessive inclination for the sentimental; but in 1792 appeared his *Het Graf* (The Tomb), a didactic poem, which, though not free from the weakness referred to, is on the whole happily conceived, and contains some admirable passages. His *De Ouderdom* (Old Age), 1802, is deficient in plan. Among his lyrical pieces, *Oden en Gedichten* (Odes and Miscellaneous Poems, 4 vols. Amst. 1796–1810), are several marked by enthusiasm and warmth of feeling. Of his tragedies, the best known are *Thirza* (1791), *Johanna Gray* (1791), and *Ines de Castro* (1793). Together with Bilderdijk, he recast in nobler form Haren's famous patriotic poem, *De Geuzen* (Les Gueux, or the Beggars), which celebrates the first struggles of the Dutch for independence. Of Feith's prose works, the most important are *Brieven over verscheiden Onderwerpen* (Letters on Different Subjects, 6 vols. Amst. 1784–90). These Letters by their polished style and refined criticism, did much to improve the literary taste of Holland.

FEKE, *fēk*, Robert: abt. 1725–1769; b. Oyster Bay, L. I.: artist. He was captured and taken to Spain while a boy, developed a natural ability for painting, and earned with his brush his passage to the United States. He settled in Newport, became a portrait painter as early as 1746, and died in the W. Indies. Specimens of his work are owned by Bowdoin College, the R. I. Hist. Soc., and Redwood Library, Newport.

FELANITCHE, *fā-lâ-nē'chā*, or Felanitz, *fā-la-nēch'* (anc. *Canatix*): town of the island of Majorca; 27 m. e.s.e. from Palma. It is in a valley, surrounded by mountains, and is well built, with a number of squares and wide streets. It has a convent and a hospital. On a neighboring hill is an ancient Moorish castle, with subterranean vaults. Linen and woolen fabrics are manufactured; rope-making and brandy-distilling also are carried on. There is some trade in the products of the neighboring country—rice, coffee, sugar, wine, brandy, fruit, and cattle. Pop. 11,018.

FELAPTON, n. *fĕ-lāp'ton*, (a word without etymological meaning but designed to have its letters symbolic): in logic the fourth mode of the third figure of syllogisms. See SYLLOGISM AND MOOD in logic.

FELDMANN, *fĕlt'mân*, LEOPOLD: 1802, May 22—1882, Mar. 26; b. Munich; of Jewish parents to whose faith he always adhered: German writer of comedies. Apprenticed 1815 to a saddler, afterward to a cobbler, he sent, in a pair of shoes which he had mended, a poetical expression of his devotion to their fair wearer. For this his master sent him back to school, where 1817, when only 15 years old, he wrote a play, *Der Falsche Eid* (The False Oath), which was actually produced on the stage. After a few years in business at Pappenheim, and subsequently in Munich, he was induced, by the reputation which he gained from some humorous pieces, entitled *Genrebilder*, to apply himself entirely to literature. In 1835, his *Höllen-lieder* (Hell-Songs) appeared; and his first comedy, *Der Sohn auf Reisen* (The Son on his Travels), was acted in Munich with applause. While travelling thereafter for five years, chiefly in Greece, he wrote *Pictures of Travel* for Lewald's *Europa*, and the correspondence for the *Allgemeine Zeitung*. In 1841, his comedy was produced in Vienna, and he was histrionic teacher in the National Theatre of that capital 1850–54. Feldmann's works, which are numerous, are reckoned among the best specimens of modern German comedy, pleasing by their cheerful humor, and happy employment of contemporary ideas and events, though deficient in artistic finish. Feldmann published a collection of his comedies, *Deutsche Originallustspiele* (1844–52: new series, 1855–57).

FELDSPAR. As to the etymology of this word there is a singular unanimity among all the standard English and German dictionaries and encyclopedias in deriving it from *Feld* a field, and *Spath* English *Spar*. J. D. Dana in his *System of Mineralogy* (6th ed. 1892, p. 315), adopts this spelling and, by implication, endorses the derivation, in the remark under the sub-head *Feldspar* 'Felspar *bad orthogr.* dating from Kirwan.' Dana has given much time and care to ascertaining the correct nomenclature of his subjects, and is *de jure* as well as *de facto* the highest authority in our language for the names of minerals. Yet in spite of this preponderance of weight in favor of the adopted spelling, no field geologists can avoid observing that feldspar is not more frequently found in fields than crockery or brickbats, whereas on the contrary it is one of the most important and universal constituents of (igneous) rock for which the German name is *Fels*. Consequently the impression cannot be dispelled that Feldspar or Feldspath is a popular or corrupted spelling of Felspar—the spar of rocks (not of fields). Kluge, while, like the rest, pronouncing the etymology of *Feld* unknown, mentions an intermediate word *Fjall* which he considers related to the old high German *Feld*

and the new high German *Fels.* (*Etymol. Wörterb. der deutsch, Sprache von Fried. Kluge. 5te. vrbes. Aufl.*, Strasburg 1894.) In fact a field, *i.e.*, the soil unencumbered by forest, is but the ground up debris of the rocks, and it seems quite possible that a language as rationally evolved as the German would indicate by the same root two objects with the same origin. Grimm connects *Feld* with similar roots in old high German, Dutch, etc., but says that *Fels* is specifically a high German word not found in Gothic, Frieslandic, nor other tongues; but introduced by Luther.

The other part of this compound word *spar* or *spath* (German) is equally embarrassing. Grimm gives *spat* as old high German, meaning a stone splitting into laminæ (blättrich brechendes Gestein). But the spars we know have no such property. Calcspar, Iron spar (carbonates of lime and iron respectively) cleave in certain directions but not in thin foliated plates like mica. His definition for *Spath*, taken from Körner, is a lamellated, crumbly, slaty, very soft, and heavy stone, etc. While this does not describe any of the known spars—least of all feldspar—it seems to suggest that the word *Spath* is derived from *spalten*, to cleave. Again, in spite of all the authorities, it seems at least possible that this word may be derived from *sphähen*, gespäht, to look intently, conspicio, and by inversion, the glint or appearance which would cause such a look.

Schade (*Alt. Deutsch. Wörterb.* 2d ed. Halle 1872–82) states the original meaning of the word in late old high German and early middle high German, to be alum, justifying Schleicher's identification of the M. H. G. Spät with Sanskrit Sphati, alum. Schade traces the origin of the word to Edessa in Syria, and assumes that Spat is of Iranian origin, and went, together with improved methods for producing alum, to Europe and to India from Persia.

It is an unquestionable property of all the spars that they have smooth crystallised facets which reflect light strongly, and their bright lustre distinguishes them from adjoining minerals. If it were permitted to adopt the two etymologies (which authority forbids) Feldspar (then Felspar) would mean, the bright crystal which sparkles in the rocks—and this would not be at all a bad description of the family.

Strictly speaking Feldspar is the name of a family of minerals, but its almost unparalleled rôle in the constitution of crystalline rocks, especially of 'fire-fluid' origin, has led to the association, with it of what would be called cousins, were we speaking of a human family.

We, should, therefore, regard the feldspars as a group in which the family from which it takes its name is very predominant.

This family itself is the crystallised type of the natural compounds which form the crust of the earth, namely the aluminum,—earth metal,—alkali metal,—Silicates, with the low specific gravity ($\pm$ 2.6) which characterises the upper solid envelope of the earth.

FELDSPAR.

As its decompositions form the main body of the mineral soil, it may be safely concluded that its composition, solubility, friability (or the facility with which it disintegrates and forms fine material to be carried by winds and water and spread over other surfaces) have profoundly modified, indeed have predetermined, the composition and character of the plants which grow on its soil, and all the animals of which this soil is the habitat.

As is the case with almost all the important and widely distributed minerals which are rock-makers the invariable constituent of feldspar is the Aluminum-Silicon part of its molecule.

The family proper of the feldspars is divided into the Orthoclase (right angled) and the Plagioclase (oblique angled) members.

The first crystallise in the system known as the Monoclinic. In this system, of the three axes *a* and *c* are perpendicular to *b* but oblique to each other; hence the term Orthoclase, meaning (preponderatingly) right angled. The Orthoclases are Aluminum-Potassium Silicates having 64.68 p. c. of Silica. In color they are pink (Pegmatite), white or gray, (Adularia Sanidine) and give these characters to the pink or gray granites and granite porphyries. Of the same chemical composition but differing very slightly from a right angle in *b c*, one of its axial intersections, is *Microcline*, which accompanies the Orthoclases more frequently than the Plagioclase members of this family.

The Plagioclases (*Plagios*—oblique) of the Feldspar family belong to the system called the *Triclinic*, of which the three axes are all oblique to each other. *Microcline* should be associated with these relatives from its crystalline structure because one of the three axial angles differs very slightly from a right angle.

The Plagioclases vary from Albite to Anorthite. Albite (*alba*—white) is an Aluminum-Sodium Silicate frequently found in crystalline schistose rocks, some crystalline limestones, also occurring occasionally as a secondary or decomposition product of other species, contains the very high value of 68+ p. c. of Silica. Oligoclase, the next member of the series, is an Aluminum-Sodium-Calcium Silicate; Silica 62 to 68 p. c. Andesine is an Aluminum-Sodium-Calcium Silicate; Silica 55.4 to 62 p. c. Labradorite is an Aluminum-Calcium-Sodium Silicate; Silica about 62 p. c. Anorthite is an Aluminum-Calcium Silicate; Silica 43 p. c.

The Plagioclases occur either in crystals visible to the naked eye, or as a cryptocrystalline matrix or ground mass. They have in common the character of striation which is usually sufficient to enable the observer to separate them from the Orthoclases.

They are generally components of the basic igneous rocks, and are often the result of metamorphic action by heat and pressure exerted on clastic and other solid rocks of igneous origin at great depths beneath the surface.

Labradorite is almost invariably present in Gabbros and Basalts. It is not uncommonly distinguished by a beautiful play of colors raising it to the rank of a gem.

FELDSPATH.

For ages, and especially in China, Orthoclase feldspar when weathered into Kaolin, and as Petunse when associated with some quartz, has furnished the principal material for the manufacture of porcelain and china.

Adularia is a transparent and colorless variety of Orthoclase usually well crystallised. It is No. 6 in the mineralogist's scale of hardness. (The scale being composed of Talc, 1; Gypsum, 2; Calcite, 3; Fluorite, 4; Apatite, 5; Adularia, 6; Quartz, 7; Topaz, 8; Corundum, 9; and Diamond 10.) But sometimes when Adularia shows pearly opalescence and a play of colors, it is cut to enhance these qualities, and is called Moonstone by jewelers.

Some rolled specimens have been called Cat's eye from a chatoyant effect similar to that of the real Chrysoberyl cat's eye. An aventurine variety of Oligoclase resembling the adventurine quartz is called Sunstone. This play of light seems to be due to mica or hematite flakes permeating its mass.

Dana's division of the Feldspar Group is as follows:

α Monoclinic Section.

Orthoclase	$K\ Al\ Si_3\ O_8$
(Soda Orthoclase)	$(K, Na)\ Al\ Si_3\ O_8$
Hyalophane	$(K_2\ Ba)\ Al_2\ Si_4\ O_{12}$

β Triclinic Section.

Microcline	$K\ Al\ Si_3\ O_8$
(Soda Microcline)	$(K, Na)\ Al\ Si_3\ O_8$
Anorthoclase	$(Na, K)\ Al\ Si_3\ O_8$

Albite, Anorthite Series (Plagioclase Feldspars).

Albite	$Na\ Al\ Si_3\ O_8$
Oligoclase, Andesine, Labradorite	$n\ Na\ Al\ Si_3\ O_8\ m\ Ca\ Al_2\ Si_2\ O_8$
Anorthite	$Ca\ Al_2\ Si_2\ O_8$
Celsian	$Ba\ Al_2\ Si_2\ O_8$

It is the α and β divisions of this family which by their disintegration and dispersion from the granites and other rocks of which they are constituents, produce the rich potash bearing soils known as 'granite' soils, easily distinguishable by the vegetation from slate, and sandstone soils.

According to the old views of petrology, or more correctly speaking lithology, feldspathic felsites, and other rocks consisting chiefly of feldspar, both phanerocrystalline (visibly crystallised), and crypto-crystalline or aphanitic (in which the crystals are too minute to be detected by the eye), would here be mentioned.

But besides the fact that the subject of this article is a mineral and not a rock, from the new point of view the word Felsite is applied to the physical rather than to the chemical constitution of igneous rocks. One of the most modern works on petrology defines Felsite as 'an aphanitic igneous rock, non-porphyritic and light colored without vitreous lustre.'—('Quant. Classf. of Rocks.')

FELDSPATH, n. *fĕl'spăth*, or FELDSPAR, n. *fĕl'spâr:* other spellings of FELDSPAR, which see. FELDSPATHIC, a. *fĕl-spăth'ĭk*, pertaining to feldspar.

FELEGYHAZA, *fā-lĕdj-hâ'zŏh:* town of Little Cumania, Hungary, on the railway between Pesth and Temesvar, 67 m. s.e. from Pesth. It has extensive trade in grain, fruit, wine, tobacco, and cattle. In the neighborhood, several Roman urns have been found. Pop. 23,912.

FELICITATE, v. *fė-lĭs'ĭ-tāt* [F. *félicité*—from L. *felicĭtātĕm*, happiness—from *felix*, happy: It. *felicita*]: to congratulate on a supposed increase of happiness; to express joy or pleasure at: ADJ. in *OE.*, made happy. FELIC'ITATING, imp. FELIC'ITATED, pp. FELIC'ITA'TION, n. *-tā-shŭn* [F.—L.]: congratulation. FELIC'ITOUS, a. *-tŭs*, very happy; delightful; very appropriate.

FELICU'DI: see LIPARI ISLANDS.

FE'LIDÆ, or FELI'NÆ: family of digitigrade carnivorous quadrupeds (see CARNIVORA: DIGITIGRADA), corresponding to the genus *Felis* of Linnæus, and sometimes collectively called *cats* or the *cat tribe*. They are, generally speaking, the most carnivorous of all the *Carnivora*, holding the same relative place among quadrupeds that the *Falconidæ* do among birds. Their organization is admirably suitable to their habits. They have a very lithe muscular frame; the body is rather long, and remarkably flexible; the limbs generally short. Few of the species possess much fleetness, but most of them excel in climbing and in leaping. When moving rapidly over the surface of the ground, they generally advance by a series of zigzag bounds, rather than by direct running. They are mostly inhabitants of forests, and many even of the larger species live much among the branches of the trees, though some of the largest do not leave the ground. They all advance stealthily on their prey, which all of them kill for themselves, and devour in a perfectly fresh state, and generally while still warm and quivering. When they have approached within a sufficient distance, they complete the seizure by a spring, many of them uttering a roar or yell as they do so, and thus rendering their victory more secure by the consternation which paralyzes the object of their attack. Their movements are extremely noiseless, owing to the soft velvety pads with which their toes are provided. Their claws are strong, much curved, very sharp, and retractile; being withdrawn by special muscles and ligaments into sheaths when not in use, and their points even turned upward, so that they are not blunted by unnecessary friction, and do not interfere with the movements of the animal by accidentally hooking objects which are in the way. The last bone (*phalanx*) and joint of the toe exhibit peculiarities requisite for the extension and retraction of the claws. The fore-feet have five toes, the hind-feet four. The head of the Felidæ is characterized by great breadth of skull, while the muzzle is short, and sometimes even rounded; the jaws are moved by very powerful muscles, and the articulation of the lower jaw is such that it has no rotary motion; the teeth also being so shaped, and those of the two jaws so fitting to each other, that

they cut like scissors—the lower teeth shutting with the upper—and are not at all adapted to the trituration of food. There are six small incisors in each jaw, followed on each side by one very large canine tooth, adapted for prehension; and this is followed by two præmolars, or false molars, which, particularly in the lower jaw, are compressed and sharp-edged, their edges rising to a central summit, with inferior lateral cusps, so that flesh between them is subjected to a cutting action in various directions. Finally, there is on each side of each jaw one true molar, and in the upper jaw of many species, a second true molar. The crowns of all the teeth are covered with enamel. The

Characteristic Features of the Felidæ:
1, tiger's head; 2, showing the dentition; 3, portion of tongue; 4, right fore paw, showing claws; 5, claw, showing tendons.

tongue is rough, with horny papillæ directed backward, by which it is fitted for cleaning the bones of the prey. The stomach is simple, the intestines short, and digestion rapid. The senses of sight and hearing are extremely acute; the eyes are adapted to seeing both by day and by night; the sense of smelling also is very acute, though apparently not equal to that of dogs; the sense of taste is supposed to be less acute; the bulbs from which the long whiskers arise appear to possess the sense of touch in great perfection, and the whiskers thus become useful in the progress of the animal through entangled thickets.

The Felidæ agree so much in form and structure, that many naturalists still refuse to divide the Linnæan genus *Felis*. None of the Felidæ are gregarious. Almost all, when taken young, seem capable of domestication, but in general they are little to be trusted. The species are numerous. They are distributed over Europe, Asia, Africa, America, and the islands adjacent to these continents; but none are found in Australia, where their place is supplied by the carnivorous marsupial quadrupeds. The

largest species are found chiefly in warm climates. No species is known to be common to the Old and New worlds, though some are very nearly allied.

Vast numbers of the larger Felidæ were brought from Africa and the East for those savage sports and shows in which the ancient Romans delighted. 500 lions were slain in five days at the opening of Pompey's theatre, and 500 panthers have been let loose at once in a similar Roman arena. The wealth of Indian princes has often been spent in fights of such beasts. For the principal Felidæ, see LION: TIGER: JAGUAR: PUMA: LEOPARD: PANTHER: CAT: TIGER-CAT: LYNX: CHEETAH: OUNCE: CARACAL: SERVAL: OCELOT, etc

FELINE, a. *fē'līn* [F. *félin*—from L. *felīnus*, belonging to a cat—from *fēlis*, a cat: It. *felino*]: pertaining to the cat kind; like a cat. FELIDÆ, n. plu. *fē'lĭ-dē*, the cat family, including the lion, tiger, and cat. FELIS, n. *fē'lĭs*, a Linnæan genus of animals corresponding with Felidæ.

FELIX, *fē'lĭks* I., Pope of Rome: d. prob. 274 (ruled prob. 269–prob. 274); reckoned the 26th in the succession of popes: succeeded Dionysius in the see of Rome. His pontificate is interesting chiefly as an early example of the relations of the Christian Church to the Roman empire, and of the recognition by the state of the civil rights of Christians. In the pontificate of Felix's predecessor Dionysius, Paul of Samosata, Bp. of Antioch, had been deposed by a council held in that city. Paul having resisted the sentence, the matter was laid before Felix, Dionysius being now dead; and, as Paul held possession of the church and church buildings, the bishops were obliged to claim the interference of Emperor Aurelian, who was passing through Antioch on his return from Palmyra. Aurelian returned a decision often appealed to in modern controversy, to the effect that the buildings should belong to the person 'to whom they should be adjudged by the bishops of Italy and Rome.' Felix afterward suffered martyrdom in the persecution of the same emperor, Aurelian.

FELIX II., Pope of Rome: occupied the Roman see during the banishment of Liberius, 355. It is agreed on all hands that his first appointment was intrusive, but much diversity of opinion exists as to his subsequent career. In reply to a petition for the recall of Liberius, it was proposed by Emperor Constantius that Liberius and Felix should exercise jurisdiction jointly; but this proposition was rejected by the Romans, and Felix appears to have been compelled to retire from the city. According to the *Liber Pontificalis*, he suffered martyrdom in the end, at the hands of his former patron, Constantius; but this is not confirmed by any contemporary authority.

FELIX III., Pope of Rome: b. Rome, of the family from which afterward sprang Pope Gregory the Great; d. 492, Feb. 24 (ruled 483–492). His pontificate is historically memorable, as presenting the commencement of the disruption of the Greek and Roman churches. The con-

temporary occupant of the see of Constantinople, Acacius, as well as the imperial court, was a favorer of the Monophysite party, who refused to accept the decision of the council of Chalcedon: see MONOPHYSITES. By their influence, the patriarch of Alexandria was deposed, and replaced by the monophysite Peter Mongus. The deposed patriarch having appealed to Rome, Felix sent two legates to Constantinople, to require his restoration; and the legates having failed in their trust, and Acacius still adhering to the heterodox party, Felix assembled a council at Rome, and excommunicated not only the offending legates, but also Acacius himself, the sentence being pinned by a monk upon the back of the patriarch's robes while he was actually officiating in the church. Felix had previously rejected the *Henoticon*, or Decree of Union, published by Emperor Zeno. The schism thus inaugurated was not healed till 519. The only literary remains of this pontiff are the letters and other acts of this controversy.

FELIX IV., Pope of Rome: b. Benevento; d. 530 (ruled 526–530); successor of John I. His pontificate presents no noteworthy event.

FELIX V. (anti-pope): see AMADEUS.

FELIX, ANTONIUS: a Roman procurator of Judæ (51–62 A.D.) in the time of the Apostle Paul, was a freedman of the Emperor Claudius I. The circumstances under which he received his appointment are related differently by Tacitus and Josephus. His government, politically considered, was in some respects good. According to Josephus and other authorities, he cleared the country of robbers, and vigorously suppressed the chaotic seditions of the Jews; but his cruelty, lust, and greed were unbounded. His wife was Drusilla, a beautiful but renegade Jewess, whom he had induced to abandon her first husband, and to form a questionable connection with himself. It was therefore not at all wonderful that Felix should tremble, as Paul reasoned of 'righteousness, temperance, and judgment to come' (Acts xxiv. 25). He was recalled to Rome, 62 A.D., on account of the accusations preferred against him by the influential Jews of Cæsarea, and narrowly escaped the sentence of death.

FELIXIANS, *fē-lĭk'sĭ-anz:* Spanish sect of the latter part of the 8th c., so-called from Felix, Bp. of Urgel. See ADOPTIAN CONTROVERSY.

FELL, a. *fĕl* [It. *fello;* OF. *felle,* fierce, cruel: L. *fel,* gall: Gael. *feall,* treachery: W. *gwal,* defect]: cruel; barbarous; fierce; dreadful: N. in *OE.,* gall. FELL'NESS, n. cruelty; savageness; fury. FEL'LEST, a. superl. very cruel; most barbarous. FELLY, ad. *fĕl'lĭ,* in a savage manner; inhumanly.

FELL, v. *fĕl* [Icel. *fella;* Dut. *vellen,* or *velden,* to fell or cause to fall]: to bring to the ground; to knock down; to hew or cut down. FEL'LING imp.: N. the act of one who cuts down trees. FELLED, pp. *fĕld.*

FELL, v. *fĕl* [Gael. *fill*, to fold, to plait: Sw. *fall*, a hem]: to turn down, as a seam: N. in *weaving*, the end of a web formed by the last thread of the weft.

FELL, n. *fĕl* [Goth. *fill;* Icel. *fell;* Dut. *vel;* L. *pellis*, skin]: a skin or hide. FELL'MONGER, n. a dealer in hides.

FELL, n. *fĕl* [Icel. *fjall*, or *fell;* Dan. *field*, a mountain —originally an open flat down]: a low-browed hill; a mountain; a mountain-side: in *OE.*, a moor; an elevated bleak tract. SHEEP-FELL, in *OE.*, an elevated open flat for sheep.

FELLAH, n. *fĕl'lă*, FEL'LAHS, or EL FEL'LAHIN, n. plu. *-lă-hēn* [Arabic word meaning peasant or agriculturist]: specially applied to the peasant tillers of the soil in Egypt by the Turks, in a contemptuous sense, as 'clowns,' or 'boors.' There seems a curious coincidence between *fellah* and the accepted etymology of *fellow*. They form the great bulk of the population and are descendants of the ancient Egyptians, intermingled with Syrians, Arabs, and other races who have been converted to Islam. In their physical conformation and features, they differ among themselves, those of the n. provinces of the Mediterranean being of whiter hue, while at Assouan they are almost black. They are described as having a large skull, facial angle almost 90 degrees, oval face, arched eyebrows, deep eyes, projecting lips, large mouth, thin beard, short nose, large chest, and small belly; arched back, and small hands and feet, and being of mean height. They form the fourth class of the population, and are distinguished from the Bedouin or free Arabs, who have entered the country later than the Saracenic conquest, and the Arabs of the town and villages. Their dress consists of a shirt and linen drawers, over which is a larger blue shirt (*herie*), girdled by a leather or stuff belt, which is exchanged in winter for a coat with sleeves (*zabout*). On their head they wear the *tarboush*, turban or a black or gray cap; the women tattoo themselves, and are nubile at an early age, being often married at 11 years, mothers at 12, and grandmothers at 24. The food of the Fellahin consists entirely of vegetables, which they eat in a crude state, dhourra bread, and beans. Even rice is too dear for them, and animal food unattainable. Their drink is limited to the waters of the Nile and coffee, and the only luxury which they enjoy is the green tobacco of the country; yet on this diet they are robust and healthy, and capable of much labor and fatigue. In their social position they are inferior to the Bedouin, who, though they will marry the daughters of the Fellahin, will not give to them their own in marriage. They appear to exhibit the moral qualities of the ancient Egyptians, being intelligent, grave and calm, docile, pliable, and sober on the one hand; and idle, jealous, quarrelsome, satirical, licentious, and of unbending obstinacy on the other, and inherit the traditional hatred of their ancestors to the payment of taxes, which are often extorted only by the bastinado. Their political con-

dition is most miserable. Each village is governed by a Sheik-el-Beled, responsible to the Nazirs and Mamours, or district officers, for the conduct of the inhabitants, and their due payment of taxes. So oppressive, indeed, is the taxation and extortion, scarcely one-twentieth of the produce falling to their lot, that it would not be possible for them to live if it were carried to a higher pitch, and none cultivate the lands with diligence unless compelled by their superiors.—Gliddon, *Types of Mankind*, p. 319; Lepsius, *Egypt and Ethiopia*, p. 76; Lane, *Manners and Customs of Modern Egyptians*, pp. 125, 126, 192, 193; Clot Bey, *Aperça générale*, I., pp. 159, 160.

FELLA'TAHS, or FOU'LAHS: see FULAHS.

FELLENBERG, *fĕl'ĕn-bĕrg*, G. *fĕl'ĕn-bĕrch*, PHILIP EMANUEL VON: 1771–1844, Nov. 21; b. Bern: founder of the institution for the improvement of education and agriculture at Hofwyl in the canton of Bern, Switzerland. His father was of patrician rank, and in consequence, a member of the government. From him Fellenberg received a very careful education, but it was his mother, great-granddaughter of the famous Dutch admiral, Van Tromp, who inspired him with the desire of usefulness. In 1789, he went to the univ. at Tübingen, for the study of law, and subsequently travelled in Europe, taking up his quarters not in the hotels of the large towns, but in the cottages of peasantry, that he might know the real condition and manners of the agricultural laborers, as well as the kind of education received by them. When the revolution of 1798 broke out in Switzerland, Fellenberg took part in it; but the faithlessness and want of public spirit on the part of the Bernese government induced him to withdraw from political life. He then purchased the estate of Hofwyl, near Bern, and soon entered into an alliance with Pestalozzi, the educationist. Their different characters, however, rendered the union impracticable, and they found it necessary to separate. Fellenberg proceeded with redoubled zeal to increase the produce of his estate by new improvements, to influence the neighborhood by his example, and to make his experiments known to the world by his agricultural treatises. At the same time, he founded an asylum for forsaken children. He also opened a school of theoretical and practical agriculture, and connected with it an institution for the education of the children of the higher classes. The pupils were all trained to work in the fields or at the bench, and the product of their labor was sufficient to cover the expenses of their education. Fellenberg's scheme was at first ridiculed by his countrymen, and looked upon for a time with some suspicion by the government; but ere long its beneficial results attracted even the attention of foreign governments. Alexander I. of Russia conferred upon the philanthropist the decoration of St. Vladimir, and sent seven young nobles to be educated at his institution. The establishment at Hofwyl acquired very great reputa-

tion, and pupils hastened to it from all quarters. Many foreign princes visited it, and on their return to their own countries, founded similar institutions. In 1830, Fellenberg founded a school of art, and some years later, an infant school. The institutions at Hofwyl were continued for some years by his son Wilhelm, and then given up. Compare Hamm, *Fellenberg's Leben und Wirken* (Bern 1845).

FELL'ING, *fĕl'lĭng*, England, town, in Durham County, on the Tyne, two miles southeast ol Newcastle. It is on the Northeastern railway. It has chemical works, glass-works, forges, factories, and coal mines nearby. Pop. 22,460.

FELLOE, n. *fĕl'lō:* see FELLY 2.

FELLOW, n. *fĕl'lō* [OE. *felaw:* Icel. *félagi*, a partner in goods; *félag*, companionship, association—from *fé*, goods; *lag*, society, a law; comp. Gael. *balaoch*, a lad—said to be from *ba*, cows; *laoch*, a lad]: a person or thing joined or associated with another; a companion; one of a pair; one of the same kind; a name of commiseration, kindly interest, or contempt; in a learned society, one who holds a higher status than that of a member; a member of a college who is on the foundation and receives an income from its revenues: V. in *OE.*, to pair with; to match. FEL'LOWSHIP, n. companionship; society; the position and emoluments of a fellow; in *college* or *univ.*, in *business*, see PARTNERSHIP. FELLOW-CREATURE, a human being; one of the same race. FELLOW-COMMONER, in *Univ. Camb.*, a student, usually married or wealthy, who, at extra charge, formerly dined at the 'commons' and associated with the fellows; known at Oxford as gentleman-commoner (see COMMON, etc). FELLOW-COUNTRYMAN, a native of the same country. FELLOW-FEELING, sympathy, joint-interest.

FELLOWS, *fĕl'ōz*, Sir CHARLES: 1799–1860, b. Nottingham, England: antiquary. In the beginning of 1838, he commenced his travels in the East. His researches were chiefly in the w. peninsula of Asia Minor, and in the region of the ancient Xanthus, in the s. of that peninsula. In the valley of the Xanthus, he discovered, only nine m. from the coast, the ruins of the city of Xanthus, former cap. of Lycia. 14 or 15 m. higher up the river, he found the ruins of another city, which, from inscriptions, he found to be the ancient Tlos. Fellows returned to England, and published *A Journal written during an Excursion in Asia Minor, by Charles Fellows*, 1838 (Lond. 1839). In 1839 he again visited Lycia, and in another excursion discovered the ruins of 13 cities. Another journal, *An account of Discoveries in Lycia, being a Journal kept during a Second Excursion in Asia Minor* (Lond. 1841), was the result of this journey. In 1841, an expedition left England to select works of art from the ancient cities discovered by Fellows, who accompanied and directed the expedition. Another expedition sent out by the trustees of the British Museum brought home 20 cases of marbles and casts, 1844. These

remains are in the British Museum, in the Lycian Saloon. In 1845, F.'s labors were rewarded by knighthood. The other works of F. are—*The Xanthian Marbles: their Acquisition and Transmission to England* (1843); *An Account of the Ionic Trophy Monument Excavated at Xanthus* (1848); a re-issue of his earlier Journals under the title of *Travels and Researches in Asia Minor, particularly in the Province of Lycia* (1852); and *Coins of Ancient Lycia before the Reign of Alexander; with an Essay on the Relative Dates of the Lycian Monuments in the British Museum* (1855).

FELLOWS, *fĕl'ōz*, JOHN: 1733-1808, Aug. 1; b. Pomfret, Conn.: soldier. He served in the French and Indian war; was elected a member of the provincial congress of Mass. 1775; organized and led a regt. of minute men to Boston directly after the fight at Lexington; was commissioned brig. gen. in the continental army 1776, June 25; and was in command of a brigade in the battles of Long Island, White Plains, and Bemis's Heights.

FEL'LOWSHIP, IN A COLLEGE OR UNIVERSITY: position and emoluments of a Fellow. For the history of this institution, see UNIVERSITY. In the two great universities of England—Oxford and Cambridge—the fellowships were either constituted by the original founders of the colleges to which they belong, or they have been since endowed. In almost all cases, their holders must have taken at least the first degree of bachelor of arts, or student in the civil law. One of the greatest changes introduced by the commissioners under the University Act of 1854, was the throwing open of the fellowships to all members of the univ. of requisite standing, by removing the old restrictions by which many of them were confined to founder's kin, or to the inhabitants of certain dioceses, archdeaconries, or other districts. Fellowships used to vary greatly in value, some at Oxford being worth £700 or £800 in good years (varying with the revenues of the college lands), and some being less than £100, both at Oxford and at Cambridge. Many fellowships were tenable for life, but they were in general forfeited should the holder attain to certain preferments in the church or at the bar. In general, also, they were forfeited by marriage, unless a special vote of the college removed the disability in any given case. But of late, great changes have been made in withdrawing restrictions as to marriage, limiting the stipends, and reducing the tenure to a definite period of years. Thus at Cambridge, under the statutes of 1881, the restrictions as to celibacy and holy orders are wholly removed; the stipend is limited in most colleges to £250 per annum (exclusive of certain allowances); and the tenure is not to be longer than six years, except in the case of fellows who occupy a university or college office. The fellowships confer on their holders the privilege of occupying apartments in the college, and generally, in addition,

certain perquisites as to meals or commons. With the single exception of Downing College, Cambridge, in which the graduates of both universities are eligible, the fellowships are confined to the graduates of the university to which they belong.

In the United States, according to the annual report of the U. S. commissioner of education for 1900–1, there was a total of 488 fellowships in 473 institutions reporting. The institutions having greatest number were Univ. of Chicago 80; Columbia Univ. 33; Cornell Univ. 24; Johns Hopkins Univ. 23; Harvard Univ. 38; Clark Univ. (Mass.) 20; Vanderbilt Univ. (Tenn.) 19; Yale 21; Univ. of Penn. 31. At the same time there were 8,132 *scholarships*, of which the greater part provide only for free tuition, though some pay a large part of a student's expenses. Johns Hopkins Univ. had both fellowships and scholarships; the former are bestowed annually upon 23 students, as an encouragement to apply all their time to the special studies in which they had shown proficiency; the latter are granted (1) according to the founder's will to studious candidates from Md., Va., and N. C., who are educated free of charge, (2) as honors to meritorious students, (3) to 10 bachelors of art of the univ. and 10 graduates of any institution who may engage in the prosecution of special work at the univ. All the scholarships carry free tuition, and, some have an additional stipend.—In some institutions the fellows are the members of the board of trustees who have charge of the business affairs.

FELLY: see under FELL 2.

FELLY, n. *fĕl'lĭ*, FELLIES, n. plu. *fĕl'lĭz* [AS. *felgu;* Ger. *felge;* Dut. *velghe;* Dan. *fælge*, a felly]: one of the curved parts of the wooden rim of a cart or carriage wheel, usually covered with an outer iron rim. FELLIES, n. plu. the whole rim: also spelled FELLOE, n. *fĕl'lō* FEL'LOES, n. plu. *-lōz*. FELLY-COUPLING, n. a box for inclosing the adjacent ends of fellies in the rim of a wheel. *Note.*—The FELLY is so named from the pieces of the rim being stuck or put together end to end: AS. *feolan*, to stick.

FELO DE SE, *fē'lō dĕ sē'* [mid. L. a felon upon himself]: in *English law*, a person who being of the age of discretion, and *compos mentis*, voluntarily kills himself, committing felony by suicide (see FELON). 'No man,' says Sir M. Hale (*Pl. of the Cr.* 411), 'hath the absolute interest of himself, but 1*st*, God Almighty has an interest and propriety in him, and therefore self-murder is a sin against God; 2*d*, The king hath an interest in him, and therefore the injunction in case of self-murder is *felonicè et voluntariè se interfecit et murderavit contra pacem domini regis.*' A man or woman is considered of full age in regard to capital offenses at the age of 14. A lunatic killing himself during a fit is not guilty of F.; but a merely melancholy and hypochondriacal temperament is not such a state of mind as will relieve a person from the consequences of this offense. Where two persons agree to die together, and in pursuance

of this design one or both die, it is suicide, or felo de se. And in some cases where one maliciously attempts to kill another, and unwittingly kills himself, this is said (Hawkins, P. C. c. 27, s. 4) to be felo de se. But as a general rule the act must be voluntary. Formerly, the law in England punished this offense by inflicting ignominy on the body of the offender, which was ordered to be buried by night at four cross-ways, and that a stake should be driven through the body. But this ignominious mode of burial is abolished, and a felo de se may be interred in cemeteries or churchyards with the usual funeral rites, if a clergyman consents to perform them. All the chattels, real and personal, of a felo de se are forfeited to the crown. See SUICIDE.

FELON, n. *fĕl′ŏn* [F. *félon*, cruel—from mid. L. *felōnem*, a felon: Bret. *fall*, bad, wicked: comp. Gael. *feall*, treachery, treason; *feallan*, a traitor—connected with *fell*, cruel]: one who has committed a crime punishable with forfeiture of goods and other penalty; a name for malignant whitlow: ADJ. pertaining to a felony; cruel; inhuman, FELONY, n. *fĕl′ŏ-nĭ*, a crime punishable with the forfeiture of goods and estates and other penalty; in *law*, every species of crime which occasions the forfeiture of land and goods; a crime in general. FELONIOUS, a. *fĕ-lō′nĭ-ŭs*, done with intention to commit crime; malignant. FELO′NIOUSLY, ad. *-lĭ*. FELONOUS, a. *fĕl′ŏ-nŭs*, in *OE.*, felonious; perfidious; traitorous.—*Felony* (a word whose origin is ultimately cognate with Lat. *fallere* and Eng. *fail*), prob. had for its original signification the act of a vassal who failed in his fidelity or allegiance to his superior, thus committing an offense by which he forfeited his fee or feud. From this it came to signify traitorous or rebellious, and was gradually generalized till it reached its popular meaning of a crime of so heinous a nature as to infer a capital punishment. The characteristic distinction of a felony, in the opinion of all legal writers, is, that it is a crime which occasions the forfeiture of the offender's goods. 'Treason itself,' says Sir Edward Coke, 'was anciently comprised under the name of felony....And not only all offenses now capital are in some degree or other felony, but.... many other offenses not punishable with death, as suicide, manslaughter, and larceny, as they submit the committers of them to forfeitures.' It may be applied to crimes entailing capital punishment, as well as to others for which capital punishment is not inflicted; and is so applied by statute in the States of New York and Massachusetts. in many States the distinction between felony and misdemeanor has been abolished, an example that in time will probably be universally followed. Compounding a felony in refraining from prosecuting a felony for a consideration, constitutes a crime. A convicted felon forfeits and is disqualified for any government or public office.—SYN. of 'felon n.': convict; criminal; culprit; malefactor.

FEL'SITE, *fĕl'sīt.* As a rock name, felsite is rather indefinite but is a very convenient name for those dense fine-grained igneous rocks, usually gray but often red or green, that to the naked eye show no crystals of minerals. Felsites generally are ancient lavas containing a high per cent. of silica and are composed almost wholly of minute crystals of quartz and feldspar. The percentage of silica varies, and the relationship and probable origin of a felsite can be determined by analysis and examination with the microscope. Igneous rocks having a finely crystalline ground mass with visible crystals are said to have a felsitic ground mass, thus petrographers speak of felsite-porphyry. See ROCKS; RHYOLITE; TRACHYTE.

FELSPAR. See FELDSPAR.

FELT, *fĕlt:* pt. and pp. of the verb FEEL, which see.

FELT, n. *fĕlt* [Ger. *filz;* Dut. *vilt;* It. *felze,* felt: mid. L. *feltrum,* a heavy cloth felted with wool: comp. Gael. *falt,* hair, matted hair (see FELL 5)]: the hide with its fur; cloth or stuff made of hair, wool, or other substance, by rolling and pressure, and not by weaving: V. to make cloth of hair, wool, or fur, by causing the material to mat together by means of pressure, rolling, or hammering. FELT'ING, imp.: N. the act or process. FELT'ER, n. one who. FELT'ED, pp.: ADJ. worked into felt. FELTLING, n. *fĕltlĭng,* the substances employed in lining puddling furnaces which are used for the production of malleable iron.—*Felt,* of hair and wool, is a fabric formed without weaving, by taking advantage of the natural tendency of the fibres of hair and wool to interlace with and cling to each other. The hatters' tradition concerning the invention of felt illustrates the principle of this manufacture. In most Rom. Cath. countries, the hatters celebrate as a festival Nov. 23, St. Clement's Day; and it is stated that St. Clement, when on a pilgrimage, put carded wool between his feet and the soles of his sandals, and found on his journey's end that the wool was converted into cloth. Although this tradition is very questionable, as the manufacture of felt is of far more ancient origin, there can be no doubt that if carded wool were thus continually trodden, and at the same time moistened, it would become felt, and all the manufacturer's processes of felting are but modifications of such treatment. This matting or felting of the fibres of hair and wool results from their structure, for, when examined by the microscope, the hair of all animals is found to be more or less jagged or notched on its surface; in some animals it is distinctly barbed; and this structure is so directed that the teeth or barbs all point towards the tip of the hair: see HAIR. If a piece of human hair (in which this structure is less marked than in most animals) be held between the finger and thumb, and rubbed in the direction of its length, it will invariably move between the fingers in the direction of its root; for the skin, while moving toward the tip of the hair, slides freely upon it, but moving in the other di-

rection, against the inclination of the barbs, it brings the hair with it. It will be easily understood that when a number of hairs are pressed together, those which lie in opposite directions to each other and in contact will interlock at these barbs or teeth, and thus resist any effort to tear them asunder. When once this close contact and interlocking is established between any two or more hairs, they remain attached, but the others that are differently arranged, or not in contact, will still be free to move upon each other; and therefore, if subjected to continual blows, pushing, and pressure, like the treading of the feet in walking, the unattached hairs will be continually shifting until they reach others in suitable positions for clinging together either by crossing obliquely or by lying in the same line, and overlapping at their ends or any other portion. When the hair has a natural tendency to curl, the felting is still more readily brought about by the additional interlacing. This is the case with wool to such an extent that when free from grease it cannot be retained in the straight carded condition required for spinning and weaving. When it is required to be felted, the natural grease has to be removed. This tendency to felt is shown in the hard lumps formed in wool-mattresses long used. The beaver-hat maker produces his felt by taking a few ounces of the mixed fur, distributing it in an even layer by twanging a bowstring against the heap, and then condensing this into a felt by a sort of kneading process with his hands; see HAT. The felt now extensively used for carpeting and other purposes is made by machinery, chiefly from the waste wool from the weaving-mills. Many patents have been taken out for the various details of felting-machinery, but the main principle is the same in all. The wool is carded more or less perfectly, steamed or moistened with hot water, and passed between beaters which act like the pilgrim's feet. When used as drugget for covering carpets, or as a substitute for carpet, the felt is printed by means of blocks with various patterns, or simply dyed. Felt is used also for padding coats and other garments, sometimes for cloaks and capes; for table covers, some of which are beautifully embossed and printed; for carriage-linings, upholstery work, polishing cloths, pianoforte hammers, and various other purposes where a coarse or thick cloth is required. A simple kind of saddle, cut out of very thick felt, is common in S. America.

The 'felted sheathing' used as a non-conducting covering for retaining the heat in steam-boilers is a substance intermediate between felt and paper, being composed of the commonest woolen refuse from paper-mills, etc., made into a semi-pulp, and beaten to produce a partial felting. This when dried hardens, and though having little tenacity and unfit for the wear of friction, has a compactness which adapts it to its purposes.—*Asphalted Roofing-felt* is a very coarse felt saturated with pitch, asphalt, or coal-tar—usually the latter for cheapness; it is sold at a very low

price and used for covering sheds and other buildings. A more expensive kind, free from coal-tar, called *Inodorous Felt*, is used as a lining for damp walls on which paper is to be hung. Asphalted felt is used also as a flooring for granaries and similar buildings, and has been recommended for public schools, to prevent the noise from the shuffling of the children's feet.

FELT GRAIN, in *wood-work*, the grain of wood whose direction is from the pith to the bark; the direction of the medullary rays in oak and some other timber.

FELTON, *fĕl'ton*, Cornelius Conway, ll.d.: president of Harvard College, and Greek scholar: 1807, Nov. 6—1862, Feb. 26; b. West Newbury, Mass.: author. He graduated at Harvard Univ. 1827, and became Latin tutor there 1829, Greek 1830, Eliot prof. of Greek 1832, and pres. 1860. He was a member of the American Acad. of Arts and Sciences, and the Mass. board of education, and regent of the Smithsonian Institution. Though he spent but a single year abroad (1853–4), he was an enthusiastic student of art and an accomplished Hellenist from early life. He was author of a number of Greek text-books, published *Homer, with English Notes and Flaxman's Illustrations* (1833); *Menzel's German Literature*, 3 vols. (1840); the *Clouds* of Aristophanes (1841); *Classical Studies*, in connection with Sears and Edwards (1843); *Poets and Poetry of Europe*, in connection with Longfellow (1845); translated Guyot's *Earth and Man*, and edited the *Panegyricus* of Isocrates and *Agamemnon* of Æschylus (1849); edited the *Birds* of Aristophanes (1852); revised and continued to date Smith's *History of Greece* (1855); published *Selections from Modern Greek Writers* (1856); and left for posthumous publication *Familiar Letters from Europe* (1864); and *Greece: Ancient and Modern*, 2 vols. (1867).

FELTON, Samuel Morse, American railroad president: b. Philadelphia, Pa., 1853, Feb. 3. He is a nephew of C. C. Felton (q. v.). He early entered railway service, being employed by the Chester Creek Railroad 1868 and appointed assistant engineer of the Lancaster Railroad 1870. He worked his way upward on various roads, through the positions of chief engineer, general superintendent and general manager, to the vice-presidency of the Erie Railroad 1885–90. He also served as president of several southern railroads and became president of the Chicago & Alton Railway Company 1899, Sept. 7.

FELTRÉ, *fĕl'trā:* town of n. Italy, province of Belluno, near the right bank of the Piave, 44 m. n.w. of Venice. It suffered severely from the attacks of the Goths in the 5th c. The chief buildings are the cathedral, the college, ecclesiastical seminary and gymnasium. Feltré has some trade in corn, wine, and oil. Pop. (1901) 15,243.

FELTRE, *fĕl'trā*, Marto da.; abt. 1474–1519; real

name PIETRO LUZZO; b. Feltre, Italy: painter. He made prolonged studies in catacombs, grottoes, and subterranean remains, formed a style of fanciful arabesque painting which gained the name of *grottesche,* whence comes *grotesque;* and is believed to have received his sobriquet 'the dead man of Feltre' because of his melancholy temperament and singular line of study. His works were received with much favor in Rome. He painted a number of fine grotesques in the Palazzo Pubblico, Florence, and, in conjunction with Giorgione, in the Fondaco dei Tedeschi, Venice; and, during a visit to his birthplace, executed some charming frescoes, still partly extant, in the loggia beside San Stefano. The church at Villabruna contains an altar-piece by him, representing the Virgin seated on a cloud, holding the child, who gives the benediction, with SS. George and Victor below. The Berlin Museum also has one of his paintings, an allegorical subject of peace and war. Feltre is charged with having broken the heart of Giorgione, his master, by eloping with his wife, and is said to have been killed in the battle at Zara, while an officer in the service of the Venetian republic.

FELUCCA, n. *fē-lŭk'kă* [It. *feluca;* Sp. *falúca;* Ar. *fulk,* an open boat, a ship]: small sailing vessel common in the Mediterranean; propelled by 10 to 16 oars, and by lateen sails. It has frequently a rudder at each end, to be applied as occasion demands. In war, feluccas armed with a heavy gun or two, and sent out as gun-boats against ships that are becalmed, have been found very troublesome; from their speed in swooth water and the difficulty of hitting them.

FEMALE, n. *fē'māl* [F. *femelle*—from L. *femella,* a female—from *femĭnă,* a woman]: one of that sex which conceives and brings forth young: ADJ. not male; pertaining to the sex that brings forth young; delicate. FEMALE-SCREW, a spiral-threaded cavity into which another screw turns; the nut. FEMININE, a. *fĕm'ĭ-nĭn* [F. *féminin*—from L. *femĭnīnus,* feminine]: belonging to the female sex; womanish; tender; delicate: N. in *gram.,* a noun or name of the female gender; in *OE.,* woman. FEMININITY, n. *fĕm-ĭn-ĭn'ĭ-tĭ,* the qualities of character pertaining to women. FEMME-COUVERTE, *făm-kûv'ėrt,* or FEME COVERTE (see below) [F. *femme,* a woman; *couvert,* covered]: in *law,* a married woman. FEMME-SOLE', *-sōl'* [OF. *sole;* L. *solus,* alone]: in *law,* an unmarried woman. FEMALE RHYMES, double rhymes, or those having added syllables—so named because in French they end in *e* weak or feminine. FEMALIZE, v. *fē'măl-īz,* to invest with the qualities or character of a female; to emasculate. FE'MALIZING, imp. FE'MALIZED, pp. *-īzd.*

FEME COVERTE, *fĕm kŭv'ėrt,* or FEMME COUVERTE (*fœmino viro co-operta*): in *law,* a married woman. See MARRIAGE: HUSBAND AND WIFE: etc.

FEMERELL, n. *fĕm′ėr-ĕl* [F. *fumerelle*—from *fumer*, to smoke; L. *fumus*, smoke]: in *arch.*, a louvre, lantern, or covering placed on the roof of a kitchen, hall, etc., for the purpose of ventilation or the escape of smoke.

FEMERN, *fā′mėrn:* island in the Prussian province of Schleswig-Holstein, taken from Denmark 1864. It is separated from Holstein by a strait called the Femern Sound, has 70 sq. m.; is flat, fruitful, and destitute of wood. Agriculture, fisheries, and stocking-weaving for exportation are the principal employments of the inhabitants. The chief town is Burg, pop. (1901) 2,911. Pop. of the island, abt. 10,000.

FEMGERICHTE or VEHMGERICHTE, *fām′gĕh-rĭċh-tĕh* [from the old German *fem*, punishment, and *gericht*, court of justice]: spoken of as the Holy Feme (or Fehme), and as the Westphalian or Secret Tribunals: among the most remarkable phenomena of the middle ages, and supplied the place of the regular administration of justice, then in a deplorable condition. The origin of these courts has been ascribed to Charlemagne, who, it was pretended, had instituted them to prevent the relapse into Paganism of the Saxons who had been forcibly converted to Christianity It is more probable, however, that they were a relic of the ancient German free courts of justice, the preservation of which may have been favored in Westphalia by special circumstances.

When Henry the Lion was put under the ban of the empire, and deprived of his possessions 1179, Westphalia, which then comprised nearly the whole district between the Rhine and the Weser, was granted to the Abp. of Cologne; and from this time the secret tribunals gained in importance. In the general confusion in Germany, when all laws, civil and ecclesiastical, had lost their authority, and the fabric of society seemed on the point of toppling into ruins, the Femgerichte were organized for the purpose of arresting the incipient anarchy that threatened to bring chaos back again, and of inspiring with salutary terror through their mysterious powers and solemn judgments, all rapacious and lawless persons (but especially the feudal barons), who were committing crimes without legal check. Thus, in the causes of their formation, and in general design, the Femgerichte resemble the Hanseatic towns. They soon acquired tremendous influence, the emperors themselves having recourse to their assistance against powerful and rebellious nobles. In the 14th and 15th c. they attained the summit of their dread authority, when they began to extend themselves over the whole of Germany. Beneficial as in many instances they proved to be, they could not fail, in the long-run, to degenerate, and to be frequently employed as a cloak to self-interest and malice. Many voices, therefore, were raised against them, and in 1461 various princes and cities of Germany, as well as the Swiss confederates, formed unions for affording justice to

every individual, and preventing any from seeking it from the secret tribunals. Particular classes likewise obtained imperial letters of protection against the pretensions of these tribunals. The emperors themselves, however, could go no further than to make some unavailing attempts to introduce improvements into the constitution of the Femgerichte, as the latter were bold enough to oppose the imperial authority, and even summoned the emperor Friedrich III. to appear before them. Their influence came to an end only when the public peace (*Landfriede*) was established in Germany, and an amended form of trial and penal judicature was introduced. The last real Femgerichte was held at Celle, in Hanover, 1568. A remnant of the institution, however, existed in Westphalia until 1811, at which time it was performing the function of a society for the suppression of vice, when it was abolished by an order of Jerome Bonaparte. Beyond the limits of Westphalia, notwithstanding all their endeavors, the Femgerichte never succeeded in fully establishing their authority; and even in the *Red Land*, as Westphalia was called (probably from the color of the soil), they were restricted by the imperial privileges on which they founded their authority.

The members of the Femgerichte were called *Wissende*, 'knowing ones,' or the *initiated*. It was necessary that they should be born in wedlock, be of the Christian religion, lead a blameless life, and bind themselves by a tremendous oath 'to support the holy Feme, and to conceal it from wife and child, father and mother, sister and brother, fire and wind, from all that the sun shines on and the rain wets, and from all that is between heaven and earth.' Originally, none but an inhabitant of the 'Red Land,' possessed of real property, could be admitted a member of the Wissende; later this rule was relaxed. From the general body were elected officers called *Freischöffen* (free justices), who were assessors of the court, and executors of its sentences. The presiding judge was called the *Freigraf* (free count). The general superintendence and presidency of the secret tribunals belonged to the lord of the land—i. e., in Westphalia, to the Abp. of Cologne. The highest office, however, as supreme president, was nominally held by the emperor, who was usually elected into the number of the Wissende on the occasion of his coronation at Aix-la-Chapelle. The court of a Freigraf was called *Freiding* (a free court of justice), and the place where he held court a *Freistuhl* (free bench or court). One of the most celebrated free courts had its seat at Dortmund. The sittings of the tribunal were either open or secret. The former were held by day in the open air, and decided in civil disputes: the secret tribunals took cognizance of those who had been unable to prove their innocence in the open courts, as well as of those who were accused of heresy, sorcery, rape, theft, robbery, or murder. The accusation was made by one of the Freischöffen, who declared, upon oath, that the accused had committed the crime. The citation was

secretly affixed, with symbolical signs, to the door of the accused, who was to meet the Wissende at a certain hour and place, and be conducted by them before the tribunal. The accused could now clear himself by an oath, but the accuser and witnesses could oppose this with another. If the accused could now bring forward six witnesses to swear in his favor, the accuser could strengthen his oath with 14 witnesses; and it was not till after 21 witnesses had made their affidavit in his favor that sentence of acquittal necessarily followed. The persons convicted, as well as those who refused to obey the summons, were given over to the Freischöffen. The first Freischöffe who met him was bound to hang him on a tree, or, if he made any resistance, to put him otherwise to death. A knife was left by the corpse, to show that it was not a murder, but a punishment inflicted by one of the Freischöffen. Compare Wigand, *Das Fehmgericht Westfalen's* (Hamm. 1825), and Usener, *Die Frei- und heimlichen Gerichte Westfalen's* (Frankfort 1832); Geisberg, *Die Fehme* (1858).

FEMORAL, a. *fĕm'ŏ-răl* [mid. L. *femorālis*—from L. *fĕmur*, the thigh, *femŏrĭs*, of the thigh: It. *femorale;* F. *fémoral*, pertaining to the thigh]: pertaining to the thigh FEMUR, n. *fē'mŭr*, a thigh-bone. FEMORAL ARTERY, an artery lying in front of the thigh, being a continuation of the external iliac.

FEMUR, *fē'mŭr*, the large bone of the thigh. The femur is the chief supporting bone of the lower limbs and is in man the main organ of locomotion, for the larger muscles of the thigh and hip are attached to it. It is the largest and longest bone of the body. The upper extremity includes a head, neck, and two bony protuberances which give attachment to the muscles rotating it. The head fits into the socket in the hip-bone, making a ball-and socket joint. (See HIP-JOINT.) It is this joint that so frequently becomes affected in tuberculosis, resulting in deformities, and also at this joint that the dislocation of the femur takes place. The main shaft of the femur is nearly circular above; below, it is somewhat flattened, and running throughout its entire posterior surface there is a rough ridge to which muscles are attached. The lower end of the femur is enlarged, and has two surfaces to articulate at the knee with the tibia and fibula of the leg. These are known as the internal and external condyles, the external one being the broader, the internal the narrower and more projecting behind and to the sides. The upper portion of the front surface of the lower end of the femur is grooved to receive the patella or kneecap. The femur averages about 18 inches in the male, and is about one inch shorter in the female. It is inclined inward at an angle of about nine degrees in the male. In the female, by reason of the comparatively broader pelvis, the angle of the femur inward is greater. The femur does not belong exclusively to warm-blooded animals: it is widely distributed in the animal kingdom. In a

whale it is only rudimentary; it is not represented in fishes, and is of varying importance in reptiles, birds, mammals, and amphibians. In the ruminants and the horse family it is a short bone; in many reptiles is slightly rudimentary; in tortoises the curve is considerable, whereas the bone in carnivora, bats, etc., is almost straight. Consult: Gerrish, *Human Anatomy* (1902). See LEG; SKELETON.

FEN, n. *fĕn* [Icel. *fen,* a morass: Dut. *veen;* Goth. *fani,* mud: comp. Gael. *fcannag,* a ridge of ground]: low, marshy, or boggy ground, covered wholly or partly with water. FEN'NY, a. *-nĭ,* pertaining to a fen. FENS: see BEDFORD LEVEL. FEN-FIRE, n. the Will-o'-the-wisp, an ignus fatuus.

FENCE, n. *fĕns* [F. *défendre,* to forbid; *défense,* prohibition: an abbreviation of *defence* (see DEFEND)]: a boundary composed of a hedge, or line of posts, or stakes driven into the ground, connected by rails; an inclosure; guard; security; the art of fencing: V. to inclose with a hedge, or a wall of posts; to protect or guard; to defend by giving and avoiding blows, as with a foil or sword. FEN'CING, imp.: N. fences, or the materials used to form them; the act or art of skilfully using a foil or sword in attack or defense. FENCED, pp. *fĕnst,* inclosed by a wall of posts; fortified. FEN'CER, n. *-sẽr,* one who. FENCIBLE, a. *fĕn'sĭ-bl,* capable of defense. FENCE'LESS, a. uninclosed. FEN'CIBLES, n. plu. *-sĭ-blz,* soldiers for home service only, or regiments raised only at and for a special crisis; sometimes, however, the local as distinguished from the general militia; also, some volunteer corps. The only British regiment remaining with this title is the 'Royal Malta Fencible Artillery.' FENCE-MONTH, n. the fawning month during which deer-hunting is forbidden. There are also fence-months for various kinds of game fishes. A FENCE among *burglars,* the person who buys stolen property. RAIL FENCE, or DORM FENCE, one made entirely of rails, the ends of which cross alternately at an angle. RING-FENCE, a fence or wall entirely surrounding an estate. FENCING THE TABLES, in the *Scotch Presb. Churches,* address by the officiating clergyman to those about to partake of the elements of the Eucharist or Lord's Supper, solemnly pointing out to them the conditions for communicating worthily, and the sins which disqualify and exclude.

FENCE, in Agriculture: guard or barrier along a boundary-line, inclosing animals on pasture-grounds, and protecting land from straying animals. They are of great variety of materials, and of very different structure. Where wood or stones are scarce, as in many countries long settled, hedges, formed of various kinds of plants, are common. These, well kept and managed, give a clothed and picturesque appearance to the landscape. The hawthorn is the well-known hedge-plant of Britain: see HEDGES. When stones are used as fences, they are built as walls.

In new countries, where trees abound, fences are mostly of wood. The snake-fence, named from its zigzag form, is

made of rails, 12–16 ft. long. The end of the lower rail is laid upon a block or stone and the others are piled above. The deflection from a right line varies from five to eight ft. Stakes are usually placed at the corners, under the top rail, to increase the height and to strengthen the fence. Post and rail fences require less timber and encumber only about one-third as much land as rail fences, but involve more work to build and are not so durable. In some parts of the country post and board fences are more popular than either of the above. Wire fences are the cheapest and most efficient and are now the most extensively built. There are about 50 different patents. The most common form is made of two twisted steel wires with barbs inserted at intervals of six or eight inches. Posts are set 16–35 ft apart, and from two to five strands of wire are fastened to them by staples made for the purpose.

Law regarding Fences.—By common law each owner of live stock was obliged, either by fencing or otherwise, to keep his animals on his own land. But the statute laws regarding fences vary greatly in different states. In most, if not all, of the states officers called 'fence-viewers' are chosen by the various towns, to whom disputes relating to fences may be referred. In the newly settled portions of the country cattle are allowed to run at large, and crops must be protected from them by suitable fences or no claim for damages can be sustained. The height of a legal F. is four ft. in some states and five ft. in others, being determined by the legislature. In sections where the law does not allow cattle to roam at will the owner of a cultivated field is not obliged to fence it, and no road side fences are required. If cattle damage the crops or the land, even if there is no F., the owner of the stock must pay therefor. This, however, does not fully apply where cattle are being driven along the highway. In such cases if the owner of the cattle has a proper number of drivers, is reasonably careful, and as quickly as possible drives the animals from the field, on which they are trespassing, he is not liable for damage done while they were temporarily beyond his control. But if cattle accidentally escape from a pasture, as when a gate is left open (even though it be opened by a trespasser), their owner is responsible for any damage that they may do. Animals trespassing in fields legally fenced, or in open fields in sections where fencing is not required, may be taken as estrays by the proprietor of the land, but if their owner is known he must be promptly notified. In some localities the cattle can be held until the damages, which should be appraised by disinterested parties, and the necessary costs, are paid; but in all cases the animals must be properly cared for by the man who has them in charge. Partition fences are to be built and maintained by the parties owning the fields which they separate, each paying one-half the cost of construction and repairs. These fences should always be on the boundary line. If either party neglects to keep his portion of the fence in repair the other should notify him that repairs are needed. If the notice is disregarded he can

make the necessary repairs and collect from the negligent party a fair remuneration for the same. If one of the owners wishes to allow his land to remain idle he cannot be required to build or repair any portion of a partition fence. In this case the party desiring to crop his land must build and maintain the entire fence until the other party brings his land into cultivation.—See TRESPASS: also FIXTURES.

FEN'CING: art of defending one's own body or assailing another person's in fair fight by the aid of a side-weapon—i.e., by a sword, rapier, or bayonet. Technically, F. is usually limited to the rapier, and works on the art treat only of attack and defense with the foil in pastime, and the rapier in actual personal combat. In a general consideration of F., however, the elements of single combat with foil, sword, and bayonet have a place. The objection formerly existed that instruction in F. encouraged a propensity to duelling; but as that absurdest of absurd customs is passing away with the advance of civilization, the objection is not now important. F. may therefore be safely learned and taught as an elegant and manly accomplishment, developing gracefulness and activity, while it imparts suppleness to the limbs, strength to the muscles, and quickness to the eye. This regards fencing with the foils (the rapier has disappeared with the duels which employed it); but instruction in fencing with the sword and bayonet, while conferring the same advantages, has in addition the recommendation of helping to fit the student for taking an active part in any general national defense. The Foil (q.v.) is a circular or polygonal bar of pliable and very highly tempered steel, mounted as any other sword, and blunted at the point by a 'button,' to prevent danger in its use. From its nature, the foil can be employed only in thrusting, and, being edgeless, it can be handled with, out liability to cutting wounds. The length of the blade should be proportioned to the height of the person using it—31 inches being the medium lenght for men, and 38 inches from hilt to point the maximum allowable. As a protection against accidental thrusts, the face is generally guarded by a wire-mask. The two portions of the blade are known as the 'forte' and the 'feeble;' the first extending from the hilt to the centre, and the other from the centre to the point.

In drawing, advance the right foot slightly to the front, take the scabbard with the left hand, raise the right elbow as high as the shoulder, seize the hilt with right hand, nails turned inward, and having drawn the foil, pass it with vivacity over the head in a semicircle, and bring it down to the guard (of which presently) with its point toward the adversary; not higher than his face, nor lower than his lowest rib. Simultaneously with the weapon being brought into position, the left hand with fingers extended should be raised to a level with the head, as a counterpoise in the various motions to ensue. In establishing the position of guard, the right foot must be advanced 24 inches before the left, the heels in a straight line, and each knee slightly bent, to impart elasticity to the movements, but

not too much, lest the firmness of the position be diminished.

In F., there are three openings or entrances—the *inside*, comprising the whole breast from shoulder to shoulder; *outside*, attackable by all the thrusts made above the wrist on the outside of the sword; and the *low parts*, embracing from the armpits to the hips. For reaching and guarding these entrances, there are five positions of the wrist—prime, seconde, tierce, carte (quarte), and quinte. The most important, and those to commence with, are carte and tierce, from which are derived the subordinate positions of carte over the arm, low carte, and flanconnade or octave, To *engage* is to cross swords with your adversary, pressing against his with sufficient force to prevent any maneuver taking you unawares. To disengage is to slip the point of your sword briskly under his blade, and to raise it again on the other side, pressing in a direction opposite to that of the previous case. The *guard* in each position is a passive obstruction to the opposing thrust; the *parade* is an active obstruction, in which the guard is first assumed, and the blade then pressed outward or inward by a turn of the wrist against the adversary's sword, so that when thrust at your body it shall be diverted from its aim, and held off. The parade may therefore be regarded as a mere extension of the guard. If the parade were called the 'parry,' it would convey its meaning more readily to English ears. Another, and perhaps more appropriate name for thrust is the 'lunge' or 'longe,' as the thrust is almost always accompanied by a lunge forward of the right foot, to give at once greater force and longer command to the blow.

The following are directions for the principal guards and thrusts.

Carte, Guard.—Turn wrist with nails upward; hand on a line with lower part of breast; arm somewhat bent, and elbow inclined a little to the outside; point of foil elevated at an angle of about 15°, and directed at upper part of adversary's breast.

Thrust.—Being at the guard in carte, straighten the arm, raise the wrist above the head, drop the foil's point to a line with the adversary's breast, throw first the wrist, and then the whole body, forward by a lunge with the right foot of two ft. from the 'guard,' the left foot remaining firm. The left hand should be dropped during the lunge to a level with the thigh, and to a position distant about 12 inches from the body; it will then afford a good counterpoise to the sword-arm. During the whole action, the body must be perfectly upright. When performed briskly, it appears that the point and foot are advanced simultaneously, but in fact the point has, or should have, priority, in order that the instantly following lunge may drive it home. Most of these observations concerning thrust in *carte* apply equally to all other thrusts.

Carte over the arm is a variety of this thrust. The sword is driven outside the adversary's blade, from the carte position, but in the tierce line.

Low Carte.—Engage adversary's blade in carte, then drop

point under his wrist, in a line to his elbow, and thrust at his flank, the body being considerably bent.

Flanconnade or Octave.—Engage adversary's blade in carte, and bind it with yours, then carry your point behind

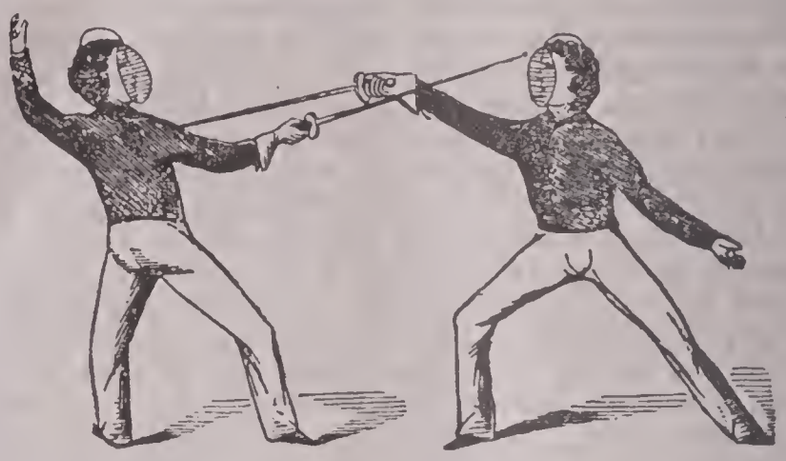


Fig. 1.—Carte.

his wrist and under his elbow: without quitting his blade, plunge your point to his flank.

Tierce, Guard.—As in carte, the nails and wrist being somewhat more downward, and the arm stretched a little outward, to cover the outside.

Parade.—Move arm, from the guard, obliquely downward to the right about six inches, and oppose the inside of the adversary's blade.

Thrust.—From the guard, turn wrist with nails downward, the same height as in carte, the inside of the arm in a line with the right temple; then thrust and lunge as in carte.

Seconde, Parade.—Nails and wrist downward, hand opposed outward, and blade, pointing low, should form an angle of about 45° with the ground.

Thrust.—The same as tierce, but delivered under the adversary's wrist and elbow, to a point between his right

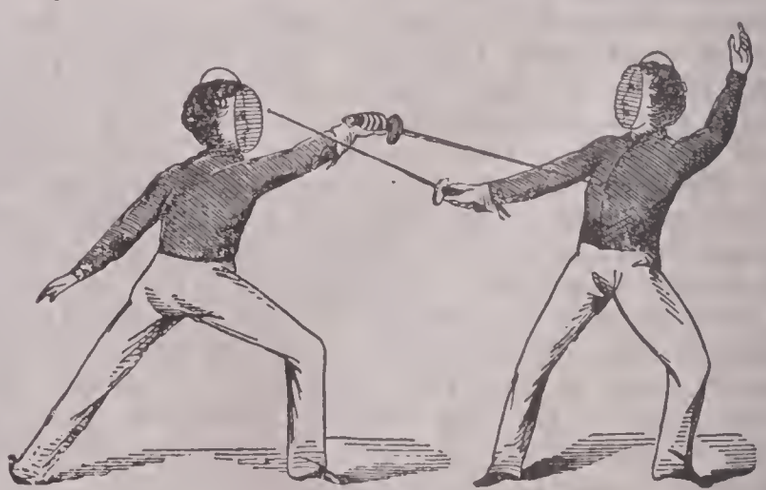


Fig 2.—Tierce.

armpit and right breast: the body to be more bent than in carte or tierce.

Prime, Parade.—In using prime to parry the thrust in seconde, pass your point over the adversary's blade, lower it to the waist, keeping your wrist as high as your mouth,

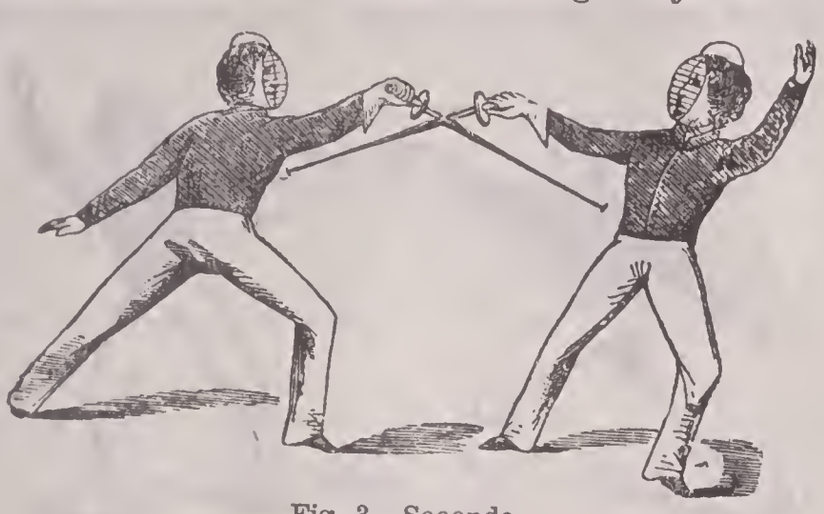


Fig. 3.—Seconde.

nails downward, elbow bent, and body held back as far as possible. The left foot should also be drawn backward a few inches, to remove the body further from the hostile point.

Thrust.—An extension movement from the parade.

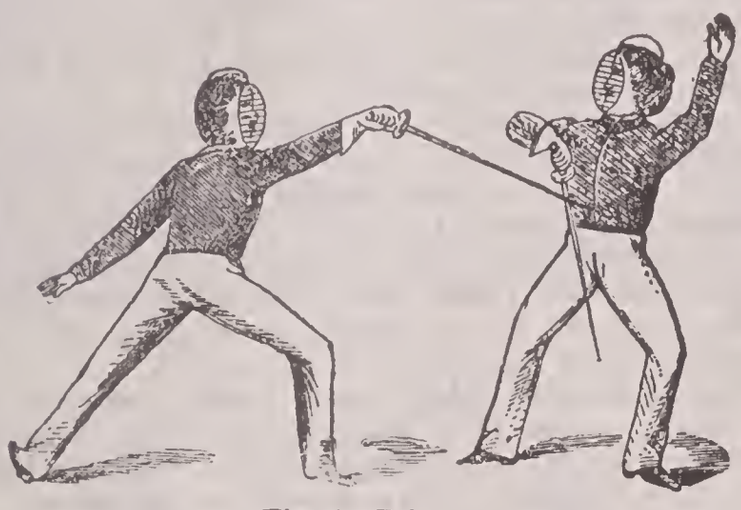


Fig. 4.—Prime.

Quinte, Parade.—Wrist in high carte, sword-point low, and oppose adversary from the forte of the outside edge of your blade.

Thrust.—Make a feint on the half-circle parade, with the wrist in carte; disengage your point over the adversary's blade, and thrust directly at his flank.

Half-circle, Parade.—One of the principal defensive parades: straighten arm, keep wrist in line with shoulder, nails up: by quick motion of wrist sweep point from right to left in a circle covering your body from head to knee, until the adversary's blade is found and opposition established.

The parades parry thrusts as follows:

Carte, with wrist low, parries low carte and seconde;

with wrist raised, all the thrusts over the point on the inside of the sword and the flanconnade.

Tierce parries, high carte; with raised wrist, parries tierce.

Seconde parries all lower thrusts, both inside and outside.

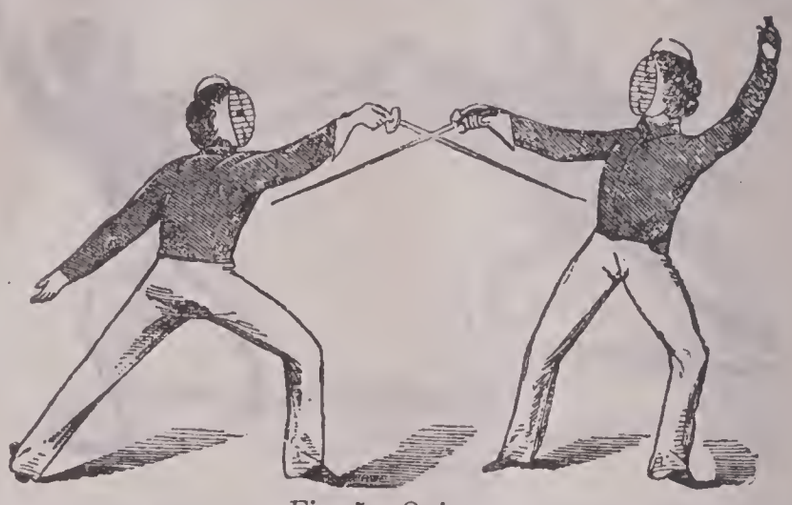


Fig. 5.—Quinte.

Half-circle parries carte, high carte, tierce, and seconde.

Prime parries carte, low carte, and seconde.

Quinte parries seconde and flanconnade.

In all parades or parries, care must be taken that in covering the side attacked, the parade is not so wide as to expose the other side to the enemy. A steady countenance, showing no disquietude at any attempt he may make, is, above all, necessary in parades.

Every parade has its return, which should be made with vivacity and decision. A thrust can be returned when the adversary thrusts, or when, baffled in his attack, he is recovering to his guard. In the first case, no lunge is necessary, the return being made from the wrist: this return requires great skill and quickness, since the adversary should receive the thrust before, by finishing his own, he has touched your body.

Ordinary Returns.—After carte parry, return in carte; after tierce, return in tierce; after parrying high carte, return seconde; after parrying seconde, return in quinte; after parade in prime, return seconde or low carte.

Feints, of which there are many varieties, consist in threatening an attack on one side of the sword, and then executing it on the other. The best parade against a feint is that of the half-circle, which will be sure to find the adversary's point.

Advance and Retreat are motions of attack or withdrawal, performed by advancing the right, or withdrawing the left foot suddenly about 18 inches, and instantly following it with the other foot. As the adversary advances, you must retreat, unless prepared to receive him at the sword-point.

Salute.—The salute is a courteous opening of the fencing, and consists in gracefully taking off the hat, while, with the foils, your adversary and yourself measure your respective distances.

Appels or beats with the right foot, *beats* on the adversary's blade, and *glissades* or glidings of one sword along the

other, are motions intended to confuse the enemy, and give openings for thrusts.

Voltes, demi-voltes, and *disarming,* were maneuvers formerly taught with care, but now quite discarded in the academies of England and France, as useless and undesirable.

In Spain and Italy, considerable differences of practice from that in France and England prevail. The left hand is used as an auxiliary in parrying, and in Italy is aided by a dagger, or sometimes a cloak. The Spaniard, though trusting to his sword and left hand only, has his blade five feet long, with sharp edges; his guard is nearly straight, and one of his favorite attacks is by a *cut* (not thrust) at the head.

In actual practice, there are endless variations of the different modes of attack and defense, which will be severally adopted according to the skill and option of the fencer. There is no finer indoor exercise than F., as the muscles in every limb are developed and strengthened by it. The great requirements for success are a steady eye and hand, a quick purpose as quickly executed, and, perhaps above all, perfect equanimity of temper.

The Sword Exercise differs from fencing with the foil in that the weapon employed has one cutting edge, as well as a point, and is therefore intended to cut and thrust. The sword is the arm, often the only arm, of officers in the army and navy, and of many non-commissioned officers. A certain degree of proficiency in its use is therefore always serviceable. In practice, the usual substitute is a stout, straight stick, called a 'single-stick,' having a basket-handle to protect the knuckles.

The position of the combatant is the same as that assumed in fencing with the foil; the lunge is similar, as are also the 'advance' and 'retreat,' and other minor points. Ac-

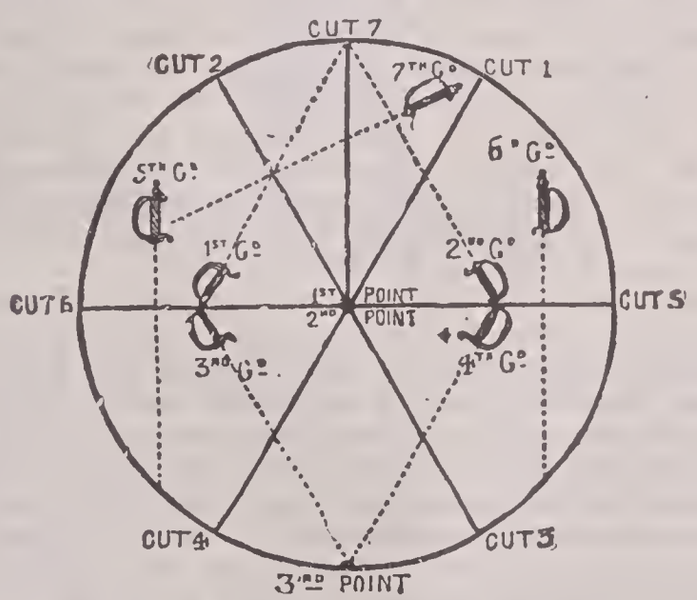


Fig. 6.

cording to the instructions of drillmasters, there are seven cuts, with seven corresponding guards, and three thrusts. The theoretical directions of all these are shown on the

accompanying diagram, which represents a target placed opposite a pupil, so that he may see the motions he is expected to perform displayed before him. The centre of the target is supposed to be in a line with the centre of his breast.

The cuts proceed from the circumference towards the centre along the *thick* lines. Nos. 1, 3, and 5 are inside cuts, and attack the left cheek, left side, and inside of the right leg respectively; 2, 4, and 6 are outside cuts, attacking the enemy's right cheek, right side, and right leg on the outside. No. 7 is a vertical cut, aimed at the head.

The dotted lines show the position of the sword in the several guards by which the cuts are opposed. The sword handles illustrate the situation of the right hand with reference to the centre of the body.

The points or thrusts are shown by the black circles. That toward No. 1 should be directed with the wrist and edge of the sword upward to the right; toward 2, with the edge upward to the left; and, in the 3d point, with the wrist rising to the centre, and the edge upward to the right.

The 'parry' is an additional defensive movement, and consists in bringing the wrist nearly to the right shoulder; whence, as centre, a circular sweep of the sword is made from left to right.

A considerable latitude is allowable in regard to the cuts, as to the part of the adversary's body at which they are directed, provided the general inclination of the blow be observed; similarly, the cut may at times be parried by a guard other than that intended specially for it, according to the discretion of the fencer.

In engaging, or joining swords, with the enemy, press the blades but lightly together, so that the hand and wrist may be readily susceptible of any motion. In making the guards, care must always be taken to receive, if possible, the feeble of the enemy's blade on the forte of your own, so as to offer the greater opposition. It should also be borne in mind that, in all cuts at the leg, when at proper distance, the shifting of your own leg, and delivering a cut at the same moment, becomes the most effectual and advantageous defense, particularly if you happen to be taller than your adversary, as you will then probably be out of his reach, while he is within yours.

In contending with bayonet or pike, the most effectual guard is the 5th, which, if well timed, enables the swordsman to seize the musket or pike with his left hand, and then make the 6th cut at his opponent's neck. In an encounter with the rapier, the best cuts are Nos. 3 and 4, as they attack the enemy's arm, which must be advanced within reach before he can touch your body, and also constitute a defense against his thrust. If the enemy—no matter how armed—be on horseback, the dismounted swordsman (provided he have proper nerve and agility) has decidedly the advantage. Endeavor to place yourself on his left, where he has less power of defending himself or his horse, and cannot reach to so great a distance as on his right: an attack on the horse will probably render it

ungovernable, and it becomes easy then to avoid the rider's blows, while he himself may be attacked with impunity in almost any direction.

Bayonet Exercise.—A proper command of the bayonet is indispensable to the soldier in any close contest. In close quarter engagements, there is no weapon more formidable from its length and weigth, the thrust of the bayonet gives a terrible wound, and its force is such that there is great difficulty in parrying the attack. Like other small-arms, it is most serviceable when handled on scientific principles; and the art of using it to advantage is so simple as to be easily acquired, while the exercise, from the weight of the rifle, admirably aids in developing the muscles of all parts of the body.

Of course, the bayonet is always fixed at the end of the musket, when it becomes virtually a pike. The position of the feet in the bayonet exercise remains always the same relatively, and absolutely until advance or retreat be effected. The right foot is thrown back 24 inches, and the weight of the body thrown upon it. The heels are kept in a line with each other, both knees bent and well apart; the right knee directly over the foot, the left easy and flexible, pointing to the front. In this position of the body, all the defensive motions of the bayonet are made. In 'guard,' the bayonet is brought nearly to a horizontal direction, level with the waist, and pointing toward the breast of an advancing enemy. Similarly, to 'guard,' the positions 'low,' 'high,' and 'second point' are assumed, the bayonet pointing as shown by the dotted lines in Fig. 7. The butt

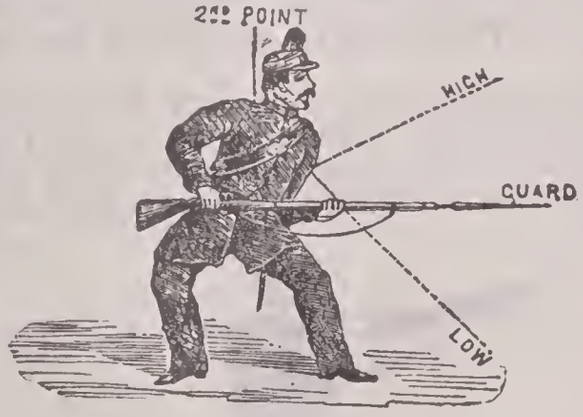


Fig. 7.

of the rifle is always kept well to the right side, the hand behind the trigger-guard, and the whole body in attitude to offer great resistance. In 'low,' the barrel is turned downward; but in all the other defensive motions it is held upward. The position of the arms is in each case that which would naturally be taken in placing the bayonet and musket in the required direction.

The offensive position of the body is acquired by the extension of the right leg, and bending forward of the left without moving the feet. The butt of the rifle is at the same time pressed firmly to the shoulder. This position is called 'point,' and constitutes an extension of the

weapon in a direction parallel with either of those previously taken. As there were four 'guards,' so there are four points, which are shown in fig. 8. The barrel is in

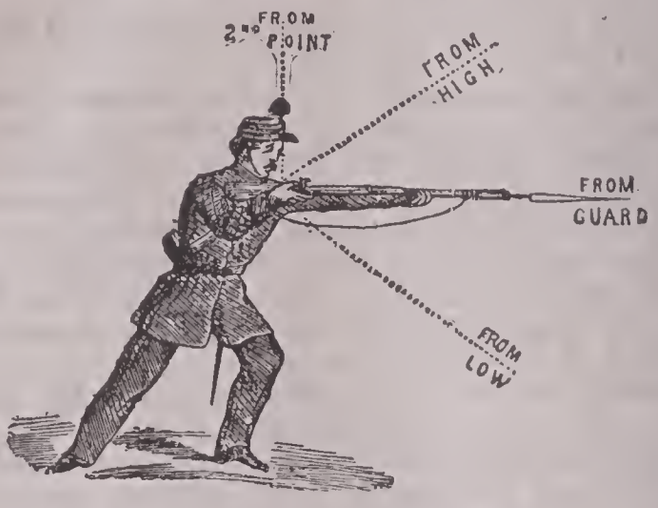


Fig. 8.

each case upward, and the motions for each are similar, except in pointing from '2d point,' when the rifle, seized by the right hand round the small of the butt, is thrust straight up above the head to the full extent of the arm, the left hand falling along the thigh, and the legs straightened so as to form an isosceles triangle.

'Shorten arms' is a useful motion, both as a defense and as a preparation for a strong attack. It consists in carrying the butt back to the full extent of the right arm, while the barrel (downward) rests upon the thick part of the left arm. The body is thrown upon the right leg, and the left straightened. This powerful position is seen in the annexed cut.

In all the guards and points, and also 'shorten arms,' the bayonet may be turned directly to the front, to the right, or to the left, as circumstances may suggest. In contending with a swordsman, the action of changing

Fig 9.

from right to left, when at the 'high' or 'low,' is sufficient defense against the ordinary cuts of the latter.

Among the treatises consulted for this article have been the works on fencing by Angelo and Roland, as well as the shorter instructions issued by the military authorities.

FEND, v. *fĕnd* [contr. of DEFEND, which see]: to ward off; to prevent from entering; to parry a charge. FEND'ING, imp. FEND'ED, pp. FENDER, n. *fĕnd'ĕr*, that which defends; a metal article placed on the hearth before the fire; a piece of timber or coil of rope hung over a ship's side to prevent injury from rubbing against another surface. FENDER-BEAM, n. the horizontal beam into which the posts of a saw-mill gate are framed at top; the inclined advance piece of an ice-breaker. FENDER-BOLT, n. in *ship-build.*, a bolt having a large head, which projects from the planking and serves as a fender to save the planks from being bruised. FENDER-POST, n. one of the guiding stanchions of a saw-gate. FENDER-STOP, n. in *r. r. eng.*, a structure at the end of a line of rails, to stop the cars or engine.

FÉNELON, *fĕn'ĕh-lon*, F. *fā-nŭh-lōng* or *fān-lōng'*, FRANÇOIS DE SALIGNAC DE LA MOTHE, Archbishop of Cambray: 1651, Aug. 6—1715, Jan. 7; b. in the château de Fénelon, province of Périgord, now in the dept. of the Dordogne; of a family which has given many celebrities to the church and to the state in France. His education was conducted at home till his 12th year, when he was transferred to Cahors, and afterward to the Plessis College in Paris. At the close of a most blameless collegiate career, he selected the priesthood as his profession, and entered, in his 20th year, the newly founded seminary of St. Sulpice, then under the celebrated Abbé Tronson, where he received holy orders 1675. Unlike many ecclesiastics of his own rank at that period, he gave his whole heart to his sacred calling. For some time after his ordination, he was employed in attendance at the hospitals, and in other parochial duties of the parish of St. Sulpice; and 1678 was named director of an institution recently founded in Paris for the reception of female converts to the Rom. Cath. faith. While in this office, he wrote his first work, *On the Education of Girls*, still a standard; and the gentleness, moderation, and charity with which he discharged his duties toward the young converts, led to his appointment as head of a mission, which, on the revocation of the Edict of Nantes 1685, was sent to preach among the Prot. population of Saintonge and Poitou. In 1688, he resumed his duties in the Maison des Nouvelles Converties, at Paris; and in the following year, he was named by Louis XIV. to the highly confidential post of preceptor of his grandson, the young Duke of Burgundy. F.'s management of this important and delicate trust showed how well he understood the true nature and objects of education. All his own instructions, and all the exercises enjoined upon his pupil, were so contrived, as, both to impart actual knowledge, and to prepare the mind and the heart of the pupil for the business of his life, by impressing him with a sense of responsibility of the great principles of truth and justice on which these responsibilities are founded, and of the hollowness and futility of all earthly glory, power, and happiness, which do not rest upon this foundation. To this wise design of the preceptor we are indebted for many works still popular in educational use: for the *Fables*, for the

Dialogues of the Dead, for the *History of the Ancient Philosophers*, for the germ at least of the *Telemachus*, and for the *Life of Charlemagne*, the manuscript of which last work, unfortunately, was burned in the fire which destroyed the archiepiscopal palace of Cambray, 1697. As an acknowledgment of these great merits, he was presented by the king, 1694, to the Abbey of St. Valery, and in the following year, to the Archbishopric of Cambray, which he accepted only on the express condition, that for nine months of each year he should be exempted from all duties as preceptor of the prince, and left at liberty to devote himself exclusively to his diocese. It is to this period of F.'s life that the history of the unhappy controversy about Quietism belongs. Without entering into the details of this singular revival of the ancient Mysticism (see MYSTICISM), it will be enough to say that two separate schools of Quietism are to be distinguished, the moral character, or at least the moral tendency, of which was exceedingly different: see QUIETISM. In one of these, the common mystic principle of the absorption of the soul in the love and contemplation of God, led to the conclusion, that the soul, in this state of absorption, became entirely passive; that it was thenceforth independent of the external world; that it suffered no contamination from the material actions of the outer man, and that no acts of virtue, not even of prayer, were any longer required: see MOLINOS. The other school, while it maintained the theory of passive contemplation and love, yet repudiated the dangerous and immoral consequences deduced therefrom. It was exclusively the latter and less objectional form of Quietism, whose professors for a time claimed, though not the patronage, yet at least the indulgent consideration of Fénelon. He formed, 1687, the acquaintance of the celebrated Madame Guyon, foundress of the French school of Quietism: see GUYON. The extraordinary piety and exemplary life of this remarkable woman, and his own natural bias toward the tender and lofty spirituality which he professed, appear to have blinded F. to the true nature and to the practical consequences of the system which she followed. Fully convinced of the unfairness of much of the outcry which was raised against her, and which made her responsible for all the principles of the grosser Quietism of Molinos, his generous mind was perhaps attracted to her cause by the very injustice of her opponents. He advised her to submit her works to the judgment of Bossuet, then in the zenith of his fame, with whom F. was in the most friendly relations. In the condemnation of the book of Madame Guyon by this prelate, F. acquiesced; but as she made a formal submission to the church, he refused to join in any condemnation of herself personally. Nevertheless, when a commission was appointed to examine the whole affair, F., though not a member, took part in the proceedings; and even suggested certain changes in their report, which he subscribed in common with the rest. To the articles prescribed for her signature by this commission, Madame Guyon readily subscribed; but it was further considered necessary not only

to publish a condemnation of her several works, but also to prepare a special exposition of the true doctrine of the church on these questions. When the work of Bossuet on this subject was completed, he submitted it to F. for his approval. This F. not only refused to give, but even composed his own *Maxims of the Saints in the Interior Life*, in explanation and defense of certain at least of Madame Guyon's doctrines. He submitted his book to the Abp. of Paris, and introduced into it some modifications which were suggested by the diocesan censors. A violation of this, committed in the absence of F., was the last of a long train of causes which led to the painful and unedifying rupture between these two great prelates. F.'s book was received with much clamor, that of Bossuet was universally approved; and in the controversy which ensued, all the weight of the displeasure of the court, which F. had provoked by the covert strictures upon the existing state of things, in which he was believed to have indulged in his works of fiction, was brought to bear against him. He was ordered to submit his book to the judgment of an ecclesiastical tribunal, of which Bossuet was a member. F. refused to accept Bossuet as judge, on the ground that he had already prejudged the cause; and in the end he appealed to the judgment of the holy see. Unfortunately, even while the affair was pending at Rome, the controversy was still maintained in France. Bossuet published a succession of pamphlets. Several of the bishops who had espoused the side of Bossuet, issued pastorals in the same sense. F. defended himself vigorously against them all in several publications, explanatory as well of his principles as of the personal imputations in which some of his adversaries did not scruple to indulge. The last blow against the ancient friendship of the great rivals was struck by Bossuet in his celebrated *Relation sur le Quiétisme*. F. was wounded to the heart. The copy of Bousset's pamphlet which first came into his hands is still preserved in the British Museum; and the margin is literally filled with remarks, annotations, replies, denials, and rejoinders, in the singularly delicate and beautiful hand writing of the indignant archbishop. The copy in the British Museum is most probably one which, as we learn from his correspondence, he sent to his agent at Rome, and on the margin of which he corrected, for the guidance of his friend, the many false and exaggerated charges of his great antagonist. The substance of these replies he gave to the public in a most masterly defense, written, printed, and published within little more than a fortnight from the appearance of Bossuet's *Relation*. From this point, the controversy assumed a more personal, therefore a more acrimonious character; and it was maintained on both sides till the long delayed decision of the pope brought it to a close, 1699, March 12, by a brief, in the usual form, condemning the *Maxims of the Saints*, and

marking with especial censure 23 propositions extracted from it. The conduct of F. under this blow constitutes, in the eyes of his fellow-churchmen, one of his highest titles to glory. He not only accepted, without hesitation, the decision of Rome, but he took the earliest occasion to publish from his own pulpit the brief of his condemnation; he issued a pastoral address to his flock, to apprise them of the judgment of Rome, and of his own cheerful acquiescence; and he presented to his cathedral a magnificent piece of church-plate, a gold ostensory, in which the Angel of Truth is represented trampling under foot many erroneous works, the most prominent of which bears the title of *Maxims of the Saints*. Bossuet is said to have been greatly touched by the conduct of his noble adversary, and to have earnestly desired a reconciliation. But the adverse influence of the king, Louis XIV., and of the court, stood in the way. The jealousy with which the political principles of F. were already regarded was heightened about this time into open hostility by the appearance of his *Telemachus* printed from a copy surreptitiously obtained by his servant, and which the king regarded as a masked satire on his own court: Sesostris being supposed to represent the Grand Monarque himself; Calypso, Madame de Montespan, Protesilaus, Louvois; and Eucharis, Mademoiselle de Fontanges. Louis's anger knew no bounds. F. was strictly restrained within his diocese; measures were taken to give the condemnation of his book every character of publicity; and what wounded him most of all, all intercourse with him, whether personal or by letter, was forbidden to his old and much-loved pupil, the Duke of Burgundy. From this date, F. lived exclusively for his flock. He founded at Cambray a seminary for his archdiocese, which he made his own especial charge. He was assiduous in preaching, and in the discharge of the other duties of his office; and the fame of his benevolence, charity, and enlightened liberality is attested by the order given in the campaign of 1709 to spare the palace and the stores of the Abp. of Cambray. The only later controversy in which he appears is the revival of the Jansenistic dispute in the well-known form of 'The Case of Conscience' (see JANSEN), in which F. engaged earnestly on the side of orthodoxy. The young Duke of Burgundy, notwithstanding the prohibition of his grandfather, retained all his old affection for his preceptor; and the highest hopes were entertained as to the future career of the pupil of such a school. These hopes were cut short by the premature death of the duke, 1712. F. survived him only about three years.

The works of F. are very voluminous. The latest collected edition extends to 20 vols. 8vo, and embraces great variety of subjects—theology, philosophy, history, literature, ancient and modern, oratory, especially the eloquence of the pulpit, asceticism, and spirituality in all its branches. His correspondence is very extensive and most interesting. Of his early sermons (one of which was delivered in his 15th year), a volume was printed 1744. Of his mature discourses, two only have reached us in a

finished state. They are of the very highest order of sacred eloquence. Of the rest, we can judge only from the skeletons which it was his habit to prepare with great exactness, and of which very many have been preserved. His literary and historical works, many of which were composed for the instruction of his pupil, are filled with allusions and suggestions illustrative of the principles of government and of the relative duties of sovereigns and subjects, far in advance of the time in which he lived. His work on the *Temporal Power of the Mediæval Popes* presents that doctrine in its most amiable form; and even his spiritual writings in general may be read, and indeed are frequently read, not only without offense, but with positive advantage, by Christians of all denominations. See Card. Bausset's *Histoire de Fénelon* (3 vols. 1808-9); also *Vie de Bossuet* of the same author. See also the Life prefixed to the collected edition of *Œuvres de Fénelon;* the voluminous correspondence in that collection; *Vie de Fénelon,* by M. Gosselin; Wunderlich's *F.* (1873); and Hunnius, *Das Leben F.'s* (1873). An English biography, one-sided, but of some value, appeared anonymously 1877; also see Ramsay, *Vie de Fénelon* (1725); Gosselin, *Histoir Littéraire de Fénelon* (1843); Butler, *Life of Fénelon* (1810); Lamartine (1854); Roy, *Histoire de Fénelon* (1842); Werfer, *Leben des Fénelon* (1852); Gandar, *Fénelon et son Temps* (1864); Lear, *Fénelon, Archbishop of Cambrai* (1876) Crausle, *Fénelon et Bossuet* (1895); Sanders, *Fénelon: His Friends and His Enemies* (1901); Saint Cyres, *François de Fénelon* (1901).—F.'s half-brother, FRANÇOIS DE SALIGNAC DE LA MOTHE F. (1641-79) was a missionary in Canada among the Cayuga Indians who had left N. Y., and settled on the Bay of Quinté.

FENELON FALLS, Canada, township in Victoria county, province of Ontario. A waterfall 300 feet wide, 21 feet high, is the chief attraction of the place. The river affords facilities for the transportation of lumber, in which the vicinity abounds. Pop. 1,150.

FENESTELLA, n. *fĕn'ĕs-tĕl'lă,* or FENESTRELLA [L. a little window]: in *geol.*, an extensive genus of polyzoa or bryozoa resembling the recent lace-coral—so called from the net-like or window-like arrangement of its cells; 30 species are described from the Lower Silurian to the Permian systems. FEN'ESTEL'LIDÆ, n. plu. *-lĭ-dē,* the group to which the *fenestella* belong; the polyzoa or lace-corals.

FENESTER, n. *fĕn'ĕs-tėr,* or FENÊTRE, n. *fē-nā'tr* [OF. *fenestré,* having many perforations: F. *fenêtre,* a window—from L. *fenestra,* an opening, a window]: an opening in a building for the admission of air and light; a window. FENESTRATION, n. *fĕn'ĕs-trā'shŭn,* the form and arrangement of windows in a building. FENESTRA, n. *fĕn-ĕs-tră,* in *anat.*, one of two small openings in the bones of the ear. FENES'TRAL, a. *-trăl,* having openings like a window. FENES'TRATE, a. *-trāt,* pierced with holes of considerable size—applied to a leaf with holes in it.

FENIAN, n. *fē'nĭ-ăn* [Gaelic and Erse, *finz*, a family, a tribe, a clan]: used by Irish Fenians to signify the Irish as a nation *par excellence;* name of a notorious secret and political society among the Irish; a follower of *Fionn* or *Finn*, Fingal, the father of Ossian; applied to the Celtic poetry which celebrates the exploits of Finn and his clansman.—*The Fenians* are a political association of Irish or Irish Americans, the object of which is the overthrow of the English authority in Ireland, and the establishment of a republic. The etymology of the name has been the subject of some discussion. It is traced to the ancient Irish military organization called Fionna Eirinn, which took its appellation from the celebrated hero of Irish legend, Finn (or Fionn) MacCumhail. The accounts of this renowned body, with which the bardic literature of Ireland abounds, are most curious. It was designed as a national militia, and its origin is ascribed, by Keating, to Sedna II., monarch of Ireland about B.C. 400. In time of peace it consisted of three bodies, each formed on the model of a Roman legion, and consisting of 3,000 men; but in war, it was capable of being enlarged to any required limit. Candidates for enrolment were required to be of honorable family, to be irreproachable in morals, and to bind themselves to observe the laws of justice and morality; they were required to be of a certain height, and strong, supple, and vigorous of body; each being submitted, before enrolment, to an ordeal, in which his powers of speed, strength, endurance, and courage were tested by trial with his future comrades. The bardic accounts of some of those conditions are extravagant and amusing, but the generally historical character of the institution is unquestionable; and it subsisted until the reign of Carbry, son of Carmac MacArt, by whom the body of Fionna Eirinn was disbanded, and the members having, in consequence, transferred their allegiance to Mocorb, King of Munster, suffered an almost total extermination in the battle of Gavra, A.D. 284, which formed the theme of many a bardic poem from the days of Oisin (known in Gaelic legend as Ossian), son of Finn MacCumhail.

Adopting the name of this ancient military association, the modern Fenians (or Finians) are a secret association for the purpose of overthrowing the alien ascendency of the Saxon, and of restoring to the ancient Celtic population their legitimate status and influence in their native country. It had its first seat in America, where the Irish population largely increased after the famine of 1846–7. Many of the emigrants being driven from their homes by arbitrary ejectment, or from inability to pay rent, carried with them a sense of bitter wrong, which prepared them for almost any enterprise which promised revenge. Others had been sympathizers, if not participators in the insurrection of 1848; and almost all were deeply imbued with general political and social discontent. By all these, the prospect of a secret organization for the establishment of Irish independence was eagerly accepted. The most openly active seat of the organization was in the western states,

especially Chicago; but the movement was directed from New York, and possessed ramifications in almost every large city of the Union. It was conducted by a senate, and consisted of 'circles,' each directed by a centre. The duty of the centres was to enrol members, who bound themselves, generally by oath, 'to be faithful to the Irish Republic as at present virtually established;' to instruct and practice them in military exercises; to raise funds for the purposes of the association, especially for purchase of arms and munitions of war; and to extend the organization by every means. Agents were sent into Ireland, and to the chief seats of the Irish population in England; and while the work of secret enrolment was industriously carried on in Ireland, measures were openly concerted in America. for raising funds by private contributions, and for pur chase of arms and military stores. Opportunely for the enterprise, the termination of the civil war in America set free a large number of military adventurers who had served as privates or as officers in one or other of the American armies, and whose experience of service was turned secretly but actively to account in the training of the young recruits enrolled in the Fenian conspiracy in Ireland. Newspapers, moreover, both in America and in Ireland. were established or subsidized for the purposes of the conspiracy; and journals, broadsides, ballads, and other inflammatory publications were largely circulated among the peasantry and artizans. Taverns, alehouses, and other places of entertainment were ordinary places of meeting; and one of the most formidable of the plans of the conspiracy was an organized attempt to seduce the Irish soldiers in the British army from their allegiance, and to prepare the way for their deserting to the ranks of Fenianism, when it should have reached the expected degree of maturity. It became apparent that in this, unlike almost all similar movements, pains were taken by the organizers to exclude the Rom. Cath. clergy—by whom the Fenian confederation had from the first been steadily resisted—from all knowledge of its character and objects, as well as of the names or number of its members in the several localities; and many of the most active of the leaders were distinguished by the freedom of their religious opinions, and by their unconcealed disregard of clerical authority.

For a time, these designs were carefully concealed, and, even when a certain publicity was given to them, the scheme appeared so wild and impracticable that it was regarded as an attempt, on the part of a body of unprincipled adventurers, to practice upon the patriotic susceptibilities of the ignorant and excitable Irish, especially in America. By degrees, however, the movement acquired more solidity, and the government ascertained that Fenianism, however corrupt in some of its sources, and however wild and extravagant in its aims, was nevertheless a reality with which it had become necessary to grapple. Measures were taken with great promptness and determination. The Habeas Corpus Act having been summarily suspended, all the known leaders in Dublin and in the provincial districts of

Ireland (most of them Irish-Americans) were at once placed under arrest. The chief journal of the conspiracy was suppressed and seized, additional troops were moved into Ireland, and other measures of repression were vigorously carried out. By these energetic measures, public tranquillity was maintained in Ireland; and, though prosecutions were instituted and a few individual conspirators convicted, so universally was the Fenian movement condemned by the public opinion of the country that most of the prisoners were discharged on condition of their leaving Ireland. But, though thus in appearance extinguished, the embers of discontent continued to smolder among the poorer peasantry and the working population of the towns; and a certain prestige was given to the fallen cause by the escape from prison, under circumstances of much mystery and a high degree of romance, of the most active and crafty of the leaders of the conspiracy. His return, and that of other exiles, to America, renewed the agitation in this country. In the early summer of 1866, a raid was attempted into Canada, and, though it proved so utter a failure as to cover its projectors with ridicule, an organization was secretly pursued, both in America and in Ireland, which resulted, in the spring of 1867, in an insane and utterly abortive attempt at insurrection at home. The plan of the conspirators was to seize the castle and military stores at Chester, and, having cut off telegraphic communication, to convey these arms to Dublin, and effect, throughout the country, a simultaneous rising in concert with the enterprise at Chester. The attempt was defeated through the treachery of one of the conspirators, by whom the plot was revealed. A partial insurrection, however, took place, concurrently with the intended attack on Chester, in the county of Kerry; and a few weeks later, a more extensive movement was attempted in the counties of Dublin, Louth, Tipperary, Limerick, and Cork. But the persons engaged in it were for the most part either American and Irish-American adventurers, or artisans, day-laborers, and mechanics, generally unprovided with arms, and in many cases scarcely beyond the years of boyhood. The only military enterprises undertaken by them consisted in a series of attacks on the barracks of the rural constabulary, in almost every instance unsuccessful; most of the parties dispersed, or were made prisoners after a single night's campaign. The rest betook themselves to the mountains, and after a few days of exposure and hardship, in which they managed to evade pursuit, and carefully avoided all encounter with the military, they were either captured or dispersed. The leaders were tried at a special commission in the spring of 1867, and tranquillity for a time seemed restored in Ireland. Much discontent, however, continued; and as the foreign organization was uncontrolled, and was still maintained, it remained as a standing element of danger and a persisting incentive to domestic disaffection. Considerable alarm was created in England and Scotland by the extent and daring of the organization among the Irish population of the large manufacturing towns. In 1867, Sep., an attack was made, in

open day, on a police-van in Manchester; the officer in charge was killed, and the prisoners, suspected Fenians, were released. A few weeks later, a still more daring attempt was made to blow down Clerkenwell Prison wall, with the same object. Alarms were circulated of intended burnings in the cities and towns; gunsmiths' shops and even government stores of fire-arms were broken open and pillaged; and a vague but wide-spread feeling of apprehension was for a time created. In 1869, the Fenian Brotherhood was formally chartered in the United States under the act for incorporating benevolent societies. The U. S. government, 1871, frustrated another Fenian raid on Canada by the apprehension of its leaders and the seizure of its arms. At the tenth congress of the brotherhood, 1871, it was reported that in about 12 years above $626,000 had been raised, of which $425,000 was expended 'for Irish revolutionary purposes direct.' Gradually the Fenian prisoners whose offense was political merely were released. The disestablishment of the Irish Church, 1869, and the Land Act, 1870, removed some grievances. The action of the Home Rule party (see HOME RULE) was kept within constitutional bounds. In 1879, Oct., the extreme section of the Home Rulers constituted the Land League, which formally insisted on fixity of tenure, fair rents, and free sale (of tenant right); and demanded, publicly but unofficially, the stoppage of all evictions and the abolition of 'landlordism.' The agitation conducted by this body was accompanied by armed intimidation and outrage. Its funds came mainly from America, and were understood to be largely derived from Fenian sources. The *Skirmishing Fund* was promoted by an Irish party in the United States, who advocated the free use of dynamite for the destruction of English public buildings and English commerce. The 'Patriotic Brotherhood' seems to have been one of several societies sprung from the F. Society; and many of the 'Invincibles,' who were to 'make history' by removing tyrants, and were the chief agents in the assassinations of the Irish Secretary and others in 1881 and 1882, had been Fenians. See IRELAND: HOME RULE.

FENN, *fĕn*, HARRY: artist; b. Richmond, England, 1838, Sep. 14. He came to the United States 1856, established himself as an artist and designer on wood, and soon attained wide fame by his book-illustrations. Shortly after the close of the civil war, he travelled extensively through the southern states and made sketches and drawings for a series of articles on *The New South*, for *Appleton's Journal*. Subsequently his travels were renewed through the United States and Canada for the purpose of procuring sketches for *Picturesque America;* and on the completion of that work he visited Europe, Egypt, Palestine, and the Sinaitic peninsula, making sketches for *Picturesque Europe*, and *Picturesque Palestine*. He was a founder of the American Water-color Society.

FENNEC, *fĕn'ĕk*, or ZERDA, *zĕr'da* (*Megalotis*): genus of *Canidæ*, peculiar to Africa, resembling foxes in general

form and in the bushy tail, but having eyes adapted for diurnal, and not for nocturnal, vision, and remarkably large ears. The species are small and beautiful. They feed partly on dates and other vegetable food; also on eggs, and on insects, which they adroitly snap as they pass.

FENNEL, n. *fĕn'nĕl* [AS. *feonel;* L. *fœnĭcŭlŭm*, fennel], (*Fœniculum*): genus of umbelliferous plants, allied to Dill (q.v.), but distinguished by the cylindrical, strongly ribbed fruit. The flowers are yellow. All the species are aromatic, and have much-divided leaves with thread-like segments. The best known is the Common Fennel (*F. vulgare*), native of the s. of Europe and parts of England, and abundant in parts of the United States. It is a biennial, three or four ft. high, cultivated in gardens chiefly for its leaves, which are boiled and served up with mackerel, with salmon, and occasionally with other kinds of fish, or are used to form a sauce for them.—Sweet Fennel, Italian Fennel, or Cretan Fennel (*F. dulce*), is a more tender plant, of much humbler growth, and annual, much cultivated in the s. of Europe; by some it is regarded as the same with the common fennel. The young sprouts from the root are sweeter and less aromatic than those of common fennel, and, when blanched, are a very agreeable salad and pot-herb. The fruit (seed) is longer and paler than that of common fennel, has a more agreeable odor and flavor, is the favorite aromatic condiment of the Italians, and is used in medicine as a carminative and aromatic stimulant. The *Oil of Fennel* is obtained from the seed. It is yellowish, somewhat thick, with an aromatic odor and sweet taste. It is lighter than water, and solidifies with moderate diminution of temperature. See Oils, Essential. Cape Fennel. (*F. Capense*), found in the interior of the Cape of Good Hope, has a thick, aromatic, esculent root.—The Panmuhooree of India (*F. panmorium*) is a species of fennel much cultivated in its native country for its sweet, warm, and aromatic fruit, which is used as a carminative and in curries.—The Giant Fennel of the s. of Europe is a plant of a different genus (*Ferula*), and abounds in a fetid juice. It is indeed closely allied to asafœtida, but forms a favorite food of buffaloes in Apulia, where it abounds. The dry dead stem is full of a white pith, used in Sicily as tinder.

FENOLLO'SA, Ernest Francisco, American writer: b. Salem, Mass., 1853, Feb. 18. He was educated at Harvard, was professor of political economy and philosophy at Tokio University, Japan, 1878-80, and of philosophy and logic 1880-6; professor of æsthetics in the Tokyo Fine Arts Academy 1887-90; and curator of the oriental art department, Boston Art Museum 1890-6. Since 1897 he has been professor of English in the High School of Tokyo. He has published monographs on art and *The Discovery of America and Other Poems* (1893); *Outline History of Ukiyo Ye* (1902), also monographs on oriental

art for Boston museum and papers on art, literature, history, etc., of China and Japan.

FENNY: see under FEN.

FENRIR: see SCANDINAVIAN MYTHOLOGY.

FENT, n. *fĕnt* [F. *fente*, a slit]: the opening left in an article of dress (as in the sleeve of a shirt, the skirt of a gown), for convenience in putting it on; a placket.

FENUGREEK, n. *fĕn'ū-grēk* [L. *fœnum*, hay: *Grœcum*, Greek—*lit.*, Greek hay], (*Trigonella*): genus of plants of nat. ord. *Papilionaceæ*, sub-order *Leguminosæ*, allied to clover and melilot. The plants are small and creeping, with pink or white flowers. The leaves have three obovate leaflets and scythe-shaped stipules. The flowers generally have the *keel* very small, so that the *wings* and *standards* present the appearance of a tripetalous corolla. The COMMON F. (*T. fœnum Grœcum*) is a native of the s. of Europe and of parts of Asia; it is much cultivated in India as a fodder-plant, and derives its name (*Fœnum Grœcum*, Greek hay) from its use as fodder in Greece. Its pods are many seeded and cylindrical; its seeds have a strong, peculiar smell, and an oily, bitter taste; the flour made from them is used for emollient poultices, but only in veterinary practice. The seeds of F. were formerly in great esteem in medicine.—Another species (*T. incisum*), growing spontaneously in many parts of India, is much used as fodder for cattle. The legumes of the ESCULENT TRIGONELLA (*T. esculenta*), also an Indian plant, are used as human food.

FENWICK, *fĕn'wĭk*, GEORGE: colonization agent of Lords Say and Brook. He came to America, 1636, to take charge of the Saybrook Plantation, in Conn., and, after a short visit to England, governed and superintended the colony, 1639-44; when he sold the plantation to the Conn. Colony, and returned to England. He was a col. in the parliamentary army, a judge at the trial of Charles I., and died 1657.

FENWICK, JOHN: 1618-83; b. England: colonist. He was a Quaker; obtained a grant of land in w. N. J. 1673; founded a colony at Salem 1675; was imprisoned by Gov. Andros, who disputed his proprietorship 1678-81; transferred his claim to William Penn; and died poor.

FENWICK, SIR JOHN, English conspirator: b. England about 1650; d. 1697, Jan. 28. He became major-general in the army, and was a member of parliament in 1677. He conspired with others against William III. and was accused of participation in the Assassination Plot in 1696. A bill of attainder being passed, he was executed for high treason, the last execution in Great Britain in consequence of attainder.

FENYES, *fĕn-yĕsh*, ELEK (Alexius): Hungarian geographer and statistical author: b. 1807, at Csokaj, county of Bihar; d. 1876. He became barrister-at-law, 1829, but began travelling over the country to gain acquaintance with the state of the Hungarian kingdom, of which there

had never been an authentic survey. His first work appeared 1840, *Hungary and Its Annexed Parts, Geographically and Statistically Considered* (6 vols. Pesth), and secured the great prize of 200 ducats from the Hungarian Academy. *The Statistics of Hungary,* 3 vols., followed (1843); *General Atlas for Hungary* (1845); *Description of Hungary* (1847); *Geographical Dictionary of Hungary* (1851)—all published at Pesth. All Fenyes's works are in the Magyar tongue, but several have been translated into German and repeatedly published. They are the first true presentations of the state of Hungary; and, for completeness, solidity, and exactness, they will bear comparison with the best works in their department in European literature. During the national government of Hungary (1848), Fenyes was chief of the statistical section.

FEODOR I., Ivanovitch, *ē-vân′ō-vich fā′ō-dōr,* Russian czar: b. 1557, May 11; d. 1598, Jan. 7. He began his reign in 1584, and being weak both in body and mind, assigned the government of his affairs to Godunoff, who seems to have managed them with dexterity and vigor. In his reign the peasants of Muscovy were converted into serfs and attached to the land. The conquest of Siberia was achieved by Godunoff, and many remarkable diplomatic relations with foreign courts were effected.

FEODOR II., Alex′ievitch, Russian czar: b. 1589; d. 1605, June 10. He was the son of Boris Godunoff.

FEODOR III., czar of Russia, and eldest brother of Peter the Great: b. 1656, June 8; d. Moscow 1682, April 27. He ascended the throne when only 19 and evinced a strength of will and determination of character which, had he lived, might have anticipated the reforms which his younger brother subsequently effected. His reign is rendered memorable on account of his calling into his presence the Muscovite nobles, who desolated the country with broils about their claims of family precedence, and throwing the rolls of the Razriad or 'Arrangement,' into the fire.

FEODO′SIA, or Theodo′sia: see Kaffa.

FEOFF, n. *fĕf* [Norm. F. *feoffer,* to invest with a fief—from *fief,* a fief]: another spelling of Fief (q.v.). Feoffment, n. *fĕf′mĕnt,* act of granting possession. Feoffee, n. *fĕf-fē′,* the person who receives or holds a feoff. Feof′fer, or -for, n. *-fėr,* one who grants a feoff.—*Feoffment* is the oldest, and long was the only, method for the conveyance of land known in England. Feoffment consisted in the formal conveyance of the land from the feoffer to the feoffee, the former stating distinctly the measure of the estate conferred, whether it was in fee, in tail, or for life. Where no mention of the duration of the estate was made, the gift was presumed to be for life. This conveyance of the land, in order to be complete, required to be accompanied by de-

livery of sasine (q.v.). Livery of sasine was of two kinds, viz., by deed, and in law. In the former case, the parties being actually upon the land, the feoffer, by delivery of a twig or a turf, testified his conveyance of the land. In livery in law, the parties being in sight of the land, the feoffer referring to the land gave possession to the feoffee. This mode of feoffment was ineffectual unless the feoffee entered into possession during the life of the feoffor. Livery in deed might be effected by attorney; but livery in law only by the parties themselves. In the earliest times these ceremonies completed the conveyance. But by degrees the practice of embodying the transaction in a deed was introduced. When a deed was used, it became customary, but not essential, to indorse on the deed the fact that livery of sasine had been made. By later laws a feoffment is void unless accompanied by deed, and the formerly possible 'tortious conveyance' was ruled out. It must be observed that the practice of feoffment above described, and which has existed in England from time immemorial, differed materially from the old form of investiture in use in strictly feudal times, and from that which still prevails in Scotland. In England, the transaction was simply a conveyance by the actual holder of the land to a new tenant, testified by certain ceremonies, but requiring no confirmation by a third party to complete it. But by feudal usages every holder of land was the vassal of some superior lord, to whom he owed suit and service, and without whose consent he could not even part with his land; hence no conveyance was complete without the reception of the new tenant by the lord paramount as his vassal. In like manner, to this day, in Scotland, no transfer of heritage is complete without the formal confirmation of the superior, though by recent legislation the old feudal usages have been abolished. See INFEFTMENT; SASINE; FEUDAL SYSTEM.

Feoffment to Uses.—A former application of the feudal form of *feoffment* in England in order to effect a conveyance in trust. The common-law courts, adhering to feudal rules, refused to recognize any interest in the land but that of the person actually infeft; but where a feoffment was made to one man *to the use* of another, the equity courts gave effect to the transaction by compelling the party infeft to hold in trust for the third person, called the *cestui que use:* see USES.

FE'RÆ [Lat. *ferus,* wild]: in the Linnæan system of zoology, an order of *Mammalia,* nearly corresponding to the *Carnaria* (q.v.) of Cuvier.

FE'RÆ NATURÆ [Lat. of a wild nature]: term in Roman law for animals which flee the dominion of man, whether beast, bird, or fish, and retain their natural freedom. According to that system, such animals became the property of any one who might catch them, irrespectively of the ownership of the soil on which they were taken, on the principle

that 'natural reason gives to the first occupant that which has no owner.'—*Inst.* ii. tit. i. s. 12. But this regulation did not prevent the prohibition of trespass. 'Of course, any one who enters the ground of another for the purpose of hunting or fowling may be prohibited by the proprietor, if he perceives his intention of entering' (*Ib.*). This right on the part of the proprietor did not affect the property of the animal taken, though it gave him an action against the trespasser. If a wild animal escaped from its captor, his proprietorship instantly ceased, and the animal might again be appropriated by its captor. This occurred even though the animal was not out of sight, if it could not be pursued without great difficulty. Even a wounded animal was not the property of the sportsman till it was caught, though the point which is decided in this sense (*Inst.* ii. tit. i. s. 13) is said to have been one on which difference of opinion had prevailed. Except so far as modified by the statutes (see GAME-LAWS), these provisions form part of the common law. Under feræ naturæ, the law of Rome included *bees*, unless included in a hive, or unless the proprietor be in pursuit of them, and has kept them in sight: see BEE. Domestic animals, though they stray, do not cease to be the property of those to whom they have belonged; but as regards animals which have a tendency to return to a state of nature, the rule of the Roman law was, that property in them continued so long as they had the intention of returning (*animum revertendi*), or rather, the habit of doing so. This rule applied to peacocks and pigeons, but not to fowls and geese; fowls and geese, though frightened and in flight, were still private property, so that whoever detained them with a view to his own profit, was guilty of theft. See DOVECOT: WARREN: FOREST LAWS: FISHES, ROYAL.

FERAL: see under FERINE.

FER DE LANCE, *fār-dē-lângs:* exceedingly venemous serpent, found in the sugar plantations of Brazil and the W. Indian Islands, dreaded alike by man and beast. It often attains a length of 8 ft., gives no warning of its intended attack, and its bite is usually fatal. It belongs to the rattlesnake family, its tail terminates in a horny spike, and when in pursuit of prey it springs to a great distance.

FERDINAND, *fĕr'dĭ-nând*, Ger. *fĕr'dē-nânt*, I., Emperor of Germany: 1503–64 (reigned 1556–64); b. Spain; son of Philip I., and brother of Charles V. whom he succeeded in the empire 1556, having been previously elected king of Rome. F. had married, 1521, Anna, daughter of Ladislaus VI., King of Bohemia and Hungary. When her brother Louis fell in battle with the Turks 1526, leaving no issue, the crown was claimed by F. in right of his wife. This involved him in a long and bloody struggle with a rival, John of Zapolya, who laid claim to Hungary, and who, as well as his son Sigismund, was supported by Soliman, Sultan of the Turks. F. at last gained the upper hand, bought off the Turks by a yearly tribute, and finally secured Hungary and Bohemia to the House of Austria. When he was elected emperor, the concessions that he had

made to the Protestants caused the pope, Paul IV., to refuse to acknowledge him. The pope's successor, Pius IV., was more complaisant; but the electors resolved that for the future the consent of the pope should not be asked, and this was carried out. Ferdinand made several attempts to reconcile the protestants and Rom. Catholics, and urged on the Council of Trent, though fruitlessly, the reformation of abuses. He left the reputation of a prudent and enlightened ruler, and was succeeded by his son, Maximilian II.

FER'DINAND II., Emperor of Germany: 1578, July 9—1637, Feb. 15 (reigned 1619-37); b. Gratz; grandson of Ferdinand I.; and son of Charles, Archduke of Styria, younger brother of Maximilian. Ferdinand's mother, Maria of Bavaria, early inspired him with hatred against the Protestants. He was educated by the Jesuits at Ingolstadt, with Maximilian of Bavaria; and at Loretto, he had taken a solemn oath, before the altar of the Mother of God, to reinstate Rom. Catholicism as the sole religion of his dominions, at any cost. As soon as he succeeded to the government of his own duchy of Styria, he set about putting down Protestantism by force. He attempted the same in Bohemia and Hungary, of which countries he had been elected king during the lifetime of Matthias Corvinus; but though at first unsuccessful, and even in danger of losing his dominions, he ultimately managed, with the aid of the Rom. Catholic league and of Elector George I. of Saxony, to subdue them. Bohemia lost all its privileges. By hanging, confiscation of property, and the banishment of innumerable families, the wretched land was reduced to obedience; and the introduction of the Jesuits, and rigorous persecution of Protestants, re-established Rom. Catholicism. Meanwhile, Ferdinand had been elected emperor of Germany (1619). The war, which properly ended with the subjugation of Bohemia, was at the same time transferred to the rest of Germany, and took the character of a religious war—the famous 'Thirty Years' war' (q.v.). The two imperial generals, Tilly and Wallenstein, were opposed by a confederacy of the Protestant states of Lower Saxony, with Christian IV. of Denmark at their head; but the confederates were defeated by Tilly at the battle of Lutter, in Brunswick, and forced to conclude peace (Lubeck 1629). Confident in the ascendency which he had acquired, Ferdinand, in the same year, issued an edict of Restitution for the whole of Germany, taking away from the Protestants nearly all the rights that they had acquired by a century of struggles; and the troops of Wallenstein and of the league were immediately set to work to carry it out in several places. But further proceedings were soon arrested by the dismissal of Wallenstein, on which the diet of the empire at Regensburg had insisted; and by the opposition of Richelieu, who put every wheel in movement to curb the power of the House of Austria. At this time also, a formidable opponent to the

schemes of the emperor appeared in the person of Gustavus Adolphus of Sweden (q.v.). After the murder of Wallenstein, the connivance at which is an ineffaceable blot on Ferdinand's memory, the imperial commander, Gallas, gained the battle of Nordlingen 1634, which had the effect of detaching Saxony from the Swedish alliance; but the ability of the Swedish generals, for whom Austria had none that were a match, and the open part that France now took in the contest, brought back the balance of victory so far to the Protestant arms that when Ferdinand died, he had given up the hope of ever attaining his objects. His reign is one of the most disastrous in history; for Germany owes him nothing but bloodshed, and misery, and desolation.

FER'DINAND III., Emperor of Germany: 1608, July 11—1657, Apr. 2 (reigned 1637-57); son of Ferdinand II. He was not so much under Jesuitical and Spanish influence as his father. Having accompanied the armies in their campaigns after the death of Wallenstein, he had witnessed the miseries of war, and was inclined to peace; but the conflicting interests of the individual belligerents hindered any unity of view, and made it necessary to proceed with the contest. Thus was this miserable war protracted, ever extending in circuit, and increasing in devastation owing to the growing licentiousness of the soldiery. At last, 1643, a congress met at Münster to arrange terms of peace, which was concluded 1648, known as the Peace of Westphalia. At the diet of the empire, 1653-4, the last presided over by an emperor in person, Ferdinand effected important alterations in the administration of justice. He died shortly after concluding an alliance with Poland against Sweden. His son, Leopold I., succeeded him in the German empire.

FER'DINAND I., Emperor of Austria: 1793, Apr. 19—1875, June 29 (reigned 1835-48); b. Vienna; eldest son of Francis I. by his second marriage with Maria Theresa of the House of Naples. He was from the first of a weak constitution, and was unfortunate in those to whom his education was intrusted. Yet he showed on all occasions a goodness of heart, which was fostered by the example of his uncle, the Archduke Charles, to whom he was much attached. While crown-prince, he travelled through his Italian provinces, Switzerland, and part of France, and took great interest in manufacturing industry. In 1835, he succeeded his father on the throne. It was expected from his character that he would inaugurate a more liberal policy than his predecessors had pursued, but the absolutist principles that seemed destined to rule forever the Austrian cabinet, triumphed, and Metternich was allowed to carry on the government. It now became obvious that Ferdinand sadly lacked moral decision, and his 'goodness' exhausted itself in numerous acts of clemency and benevolence. Nevertheless, during his reign, the industry of Austria made great advance, and the great network of railroads and highways was begun. The insurrection in Gali-

cia 1846, led to the annexation of Cracow to Austria. No country was more affected by the European movement that began in the winter of 1847-8 than Austria, though the revolutionary storms that shook the empire cannot be attributed to any want of good-will to his people on the part of Ferdinand, but only to complete lack of political wisdom. On the disturbances breaking out in March, he consented to the dismissal of Metternich, the appointment of a responsible ministry, and granted the outlines of a constitution. In May, he retired with his court to Innspruck, but was induced to return to the capital in August. At last, the October insurrection in Vienna caused him again to leave the palace of Schönbrunn, and retire to Olmütz, where, 1848, Dec. 2, he abdicated in favor of his nephew, Franz Joseph. He afterward resided at Prague, where he died. He married, 1831, Feb. 27, Caroline, daughter of Victor-Emmanuel I., King of Sardinia, but had no children.

FER'DINAND I. (The Just), King of Aragon and Sicily: 1379-1416 (reigned 1412-16); younger son of John I. of Castile and Leonora of Aragon. In 1406 he refused the crown of Castile when offered by the nobles on the death of his brother Henry III., but accepted the regency as his brother had desired during the minority of John II., his nephew. He obtained signal victories over the Moors with his army and navy, and directed the domestic affairs of the kingdom with a liberal and prudent hand. When Martin, King of Aragon and Sicily, his uncle on his mother's side, died, he was brought forward as a candidate for the throne, and supported with much zeal by a strong party in the state, though he had no claims under the laws of descent. The manifestation in his favor became so strong that the question of succession was referred to a body of 9 judges, representing Catalonia, Valencia, and Aragon, and he was elected 1412. He deferred his coronation till after he had subjugated his rivals, and on the defeat of Count Jayme of Urgel at Balaguer, his last opponent, the ceremony was performed at Saragossa 1414. In the same year he was a stanch supporter of the claims of the Spaniard, Benedict XIII. (Peter de Luna), at the council of Constance, when the papal schism was at its height, and three rival popes were claiming the obedience of the faithful. In the following year John XXIII. was deposed and Gregory XII. abdicated. These events prepared the way for peace, and Ferdinand, anxious to have the unity of the church restored, took part in a conference between Sigismund and representatives of France, Castile, and Navarre, and renounced obedience to the Spanish papal claimant. Ferdinand was succeeded by his son Alphonso V., known as the conqueror of Naples.

FER'DINAND II., King of Aragon and Sicily: see Ferdinand V. (The Catholic), of Castile.

FERDINAND I., King of Naples: 1423-94 (reigned 1458-94); illegitimate son of Alphonso V. On the death of

his father, who had ruled Naples, Sicily, Aragon, and Sardinia, he received the throne of Naples 1458, and entered upon a troublesome reign. Many of the most powerful nobles conspired to aid John of Anjou in seizing the country. John invaded the kingdom and defeated Ferdinand at Nola 1460, from which Ferdinand fled to his capital with but 20 followers. In his dire extremity Pope Pius II., the Duke of Milan, and the Albanian chief Scanderbeg, came to his relief, and the latter, assuming command of the army, defeated John at Troja and forced him from Italy 1462. In 1480 the Turks descended upon Italy and took Otranto, but Ferdinand recovered the city the next year. The nobles again revolted 1485, when he appeased them with promises that he afterward broke; he was excommunicated by Pope Innocent VIII. 1489, but regained his favor 1492; and died while the expedition of Charles VIII. of France was on its way to invade Italy.

FER'DINAND III., King of Naples: see FERDINAND V. (THE CATHOLIC), of Castile.

FER'DINAND I. (THE GREAT), first king of independent Castile: 1000-1065, Dec. 27 (reigned 1033-65); second son of Sancho el Mayor, King of Navarre. In 1026 his father compelled Bermudo III., King of Leon, to surrender his rights over Castile, and to give his sister Dona Sancha in marriage to Ferdinand, then regent of that province. The marriage was consummated and Ferdinand received the title of king of Castile 1033. Sancho died 1035, after dividing his possessions among his four sons, giving to Ferdinand Castile, which was henceforth recognized as an independent sovereignty. Shortly after the death of Sancho, Bermudo attempted to recover his lost possessions, but was defeated and slain by Ferdinand in the battle at Lantada near Rio Carrion 1038. Ferdinand then claimed and received the crown of Leon, in right of his queen, and entered upon a conciliatory and equitable reign which soon won for him the esteem and support of his new subjects. He gained a considerable portion of Portugal by invasion and conquest 1045; extended the Christian frontier from the Douro to the Mondego and reduced to vassalage the emirs of Toledo, Saragossa, and Seville, by his wars against the Moors 1046-49; and secured a large portion of territory belonging to Navarre and made himself the most powerful among the Christian princes in the peninsula by defeating his brother, Garcia III., King of Navarre, who had invaded his possessions, in a battle at Atapuerca near Burgos, 1053. About 1055 Ferdinand assumed the title of emperor, with a view of indicating his supremacy in Spain; but the act was held by the emperor Henry III. to be an infringement of his own rights of suzerainty, and his complaint was sustained by Pope Victor II. Subsequently a decision was given favoring Ferdinand's imperial claims so far as they covered the territory that he had wrested from the Moors. In 1063 he forced the emir of Seville to restore to him the relics of St. Isidro; and in 1065, while

on an expedition against Valencia, he was seized with a mortal sickness, and returning to his capital, Leon, divided his possessions among his three sons, and spent his last days in rigid devotional exercises.

FER'DINAND II., King of Leon: 1136-88 (reigned 1157-88); younger son of Alphonso VIII. On the death of his father he received the kingdom of Leon, that of Castile having been bequeathed to his brother Sancho III. In 1158 his possessions were invaded by Sancho, who took advantage of a rupture between Ferdinand and his most powerful nobles, and Ferdinand was forced into submission to his brother. Sancho died shortly afterward and then Ferdinand took possession of Castile under the pretense of guarding the interests of his nephew Alphonso III. thereby, and held it till Alphonso's marriage with Leonora, daughter of Henry II. of England, 1170. Ferdinand became involved in a war with his father-in-law, Alphonso I. of Portugal, by repudiating his wife, and defeated and captured him at Badajoz 1169. He waged war successfully against the Moors, and instituted the military order of Alcantara.

FER'DINAND III. (Saint), King of Castile and Leon: 1200-52 (reigned 1217-52); son of Alphonso IX. of Leon, and of Berenguela, sister of Henry I, of Castile. His uncle died without issue 1217, and through his mother's influence the title of Blanche, the elder of the surviving sisters, was set aside, and the crown given to Ferdinand. By wise administration he gained the support of the chief towns and the most powerful nobles, and (1225) began a career of conquest which effectually broke the Moorish power in Spain. His father died 1230, and in his will declared his marriage with Berenguela void, and designated his two daughters by his first marriage his successors. Ferdinand interrupted his Mohammedan crusade long enough to insure his own inheritance and thus permanently united the kingdoms of Castile and Leon under one crown. Resuming his military operations he conquered Ubeda 1234, Cordova 1226, Jaen 1245, and Seville 1248, the latter surrendering Nov. 23, after a siege of nearly two years. While planning an invasion of Africa, he died in Seville 1252, May 30, bequeathing his kingdom to his eldest son Alphonso X. Ferdinand was distinguished as much for religious zeal as for military prowess. He was an uncompromising enemy of the Jews and Albigenses, who had sought asylum in his possessions; founded the Univ. of Salamanca, 1243, which his son nobly fostered; had the code of Visigothic laws translated into the vulgar tongue; was popularly known as *el Santo* from an early age because of his devotion to the Rom. Cath. Church; and was canonized by Pope Clement X. 1671, his day in the Spanish calendar being that of his death.

FER'DINAND IV., King of Castile and Leon: 1285-1312 (reigned 1295-1312); son of Sancho IV. He succeed-

ed his father when 10 years old, and at once had his possessions contested by his uncle Enrique who was anxious to become regent, by Don Juan Nunez de Lara who wanted to enlarge his estates, and by his cousins the infantes of La Cerda, who first claimed the crown and then aspired to a division of the kingdom. Through the shrewdness of his mother, Maria de Molina, these several schemes were frustrated. The king of Portugal was conciliated and gave his daughter Constanza in marriage to Ferdinand, and an alliance was effected with the king of Aragon. As soon as Ferdinand was secure in the possession of his throne, he resumed the policy of war against the Moors, and was pecuniarly aided by Pope Clement V. and his own nobles. He took Gibraltar 1309, and on the extinction of the order of Templars by the Pope 1310, confiscated their property and shared it with other orders of chivalry. He died suddenly at Jaen, 1312, Sep. 7, and was succeeded by his infant son, Alphonso XI.

FER'DINAND THE CATHOLIC, King of Spain—V. of Castile, II. of Aragon, III. of Naples, II. of Sicily: 1452. Mar. 10—1516, Jan. 23 (reigned 1474-1516); son of John II., King of Navarre and Aragon. In 1469 he married at Valladolid, Isabella, sister of Henry IV. of Castile. Even in the lifetime of his father, events were paving the way for the union of the two kingdoms of Castile and Aragon. On the death of Henry IV. of Castile, 1474, the cortes refused to acknowledge the legitimacy of his daughter Juana, and proclaimed Isabella and her husband Ferdinand joint-sovereigns. A war ensued, in which they were completely successful. In 1479, Ferdinand becoming king of Aragon on the death of his father, the two kingdoms of Aragon and Castile were united in the persons of Ferdinand and Isabella. Isabella, however, as long as she lived, maintained her position as queen of Castile, and allowed her husband no other share in the government than the privilege of affixing his signature to the decrees and of uniting his arms with her own. Ferdinand's whole reign was an uninterrupted series of successful wars. In Castile, he distinguished himself by the effectual suppression of the banditti, who had become formidable in the confusion resulting from the civil wars. This he accomplished by reorganizing and putting in force against them the *hermandad*, or brotherhood, a kind of Spanish militia, composed of the citizens and the country-people. But Ferdinand, whose craft and vigor were quite Machiavelian, was not content with taking strong measures against the Castilian outlaws; he resolved also to break the power of the feudal nobility, and made good use of the *hermandad* in carrying out this design. Cities and towns were encouraged to make themselves independent of the nobles, who were deprived of many important privileges, and among other humiliations, were subjected to the ordinary tribunals of justice. The establishment of the Inquisition 1478-80, though primarily and mainly intended to further 'religious' ends, like-

wise helped to lessen their influence. Ferdinand strengthened his power also by vesting in himself and his successors the grand-mastership of the military orders of Calatrava, Alcantara, and Santiago. In all his schemes, Ferdinand was ably seconded by his queen Isabella, and by the celebrated Cardinal Ximenes. The year 1492 was the most brilliant in his reign, and is one of the most important in the history of the material progress of the world. It was signalized by the discovery of America by Christopher Columbus, though the honor of having aided the great navigator belongs not to Ferdinand but to Isabella. The same year witnessed the capture of Granada, and the retreat of the last Moorish monarch into Africa. Ferdinand, who had a true Spanish hatred of heresy, immediately issued an order for the expulsion of the Jews from the conquered kingdom; and, in consequence, 160,000—some say 800,000—of his new subjects were compelled to scatter themselves over Europe. This act, neither wise nor Christian, was in accordance with the religious barbarism of the age, and especially of Spain. It was followed, several years afterward by the persecution and expulsion of the Moors—an act still more unwise than the former, for the Moors of Granada were unquestionably the most industrious, civilized, and refined inhabitants of the peninsula. Ferdinand was as successful abroad as at home. He was victorious over Alfonso V., King of Portugal; while his general, Gonzalvo de Cordova, twice wrested Naples from the French—the second time in 1503—after which it remained permanently in Ferdinand's possession. In the following year, Isabella died; and in 1505, he married Germaine de Foix, niece of Louis XII. of France. He took part in the famous league of Cambrai against Venice 1508; made himself master of various towns and fortresses in Africa; and, 1512, conquered the kingdom of Navarre; thus becoming monarch of Spain from the Pyrenees to the Rock of Gibraltar. He died at Madrigalejo, and was succeeded by his grandson, Charles V. To Ferdinand and Isabella Spain owes her unity and greatness as a nation; and, in the no less skillful hands of their successor, she exercised an imperial influence over Europe, which it required Luther and the Reformation to check. See Prescott's *History of the Reign of Ferdinand and Isabella of Spain* (1838).

FER'DINAND VI. (The Sage), King of Spain: 1713-1759, Aug. 10 (reigned 1746-59; son of Philip V. and Louisa Maria of Savoy. He was proclaimed prince of the Asturias on the death of his elder brother Louis, 1725; was betrothed to Barbara, daughter of John V. of Portugal, 1729; and succeeded his father 1746, July 9. His main efforts after ascending the throne were to secure peace for his country, which had been exhausted by wars with England and Austria, and within a month he ordered the withdrawal of the Spanish troops from Italy, and began negotiations with England which resulted in the treaty of Aix-la-Chapelle and the restoration of peace to Europe 1748, Oct. He then gave great encouragement to manufactures.

arts, and literature, improved the army and navy, reformed many abuses of ecclesiastical patronage, and, becoming weak in health and despondent in temperament, gradually relinquished the active control of state affairs to the queen, his ministers, and the tenor Farinelli (q.v.), whose singing had a remarkably soothing influence over him, and who thereby became very powerful at court. At the outbreak of the seven years' war 1756 he maintained a strict neutrality, though offered Minorca by France and Gibraltar by England for his assistance. His queen died 1758, and he immediately fell into a deep melancholy which resulted in insanity and his death at Villaviciosa. As he left no issue, he was succeeded by his half-brother Charles III., according to the terms of the Aix-la-Chapelle treaty.

FER'DINAND VII., King of Spain: 1784, Oct. 14—1833, Sep. 29 (reigned 1814-33); son of Charles IV. and the princess Maria Louisa of Parma. Although he had the advantage of excellent preceptors, especially the Canon Escoiquiz, in his youth, yet the machinations of the notorious Godoy, minister of Spain, precluded his opportunities for the intelligent exercise of his faculties. A deliberate attempt was made by his mother and Godoy to degrade him into a lover of mere animal pleasures, that their influence and authority might be unrestrained. Ferdinand soon conceived an aversion to the minister, which was increased by his marriage in 1802 with the amiable and accomplished Maria Antonietta Theresa, daughter of Ferdinand I., King of the Two Sicilies. This lady, who endeavored to maintain her husband's dignity, died, 1806, May 21, of grief, as is supposed, at the insults offered to her by Godoy, the king himself, and above all by the queen. Suspicions of foul play, however, were entertained by Ferdinand. Mainly for the purpose of gratifying their hatred of Godoy, a number of the nobles, headed by the Duke of Infantado, assembled round Ferdinand, the crown-prince. A false step that the latter now took proved the beginning of great misery to Spain. By the advice of the Canon Escoiquiz, he wrote a letter to Napoleon, in which he expressed a wish to marry the eldest daughter of Lucien Bonaparte. This letter fell into the hands of the minister himself, and the prince was in consequence arrested in the Escorial, 1807, Oct. 28, and declared a traitor by a royal proclamation, written in Godoy's own hand, and addressed to the Council of Castile. The animosity of the people toward the minister led to the revolution of Aranjuez, and the king abdicated in favor of Ferdinand, 1808, Mar. 19. Almost immediately however, Charles wrote to Napoleon, declaring his abdication to be forced. Napoleon, who had designs of his own upon Spain, refused to recognize Ferdinand as king, but sent him an invitation to meet him at Bayonne. In spite of all warnings to the contrary, Ferdinand repaired to Bayonne, at which place he arrived Apr. 20, and was received with distinction by Napoleon. Meanwhile, however, the French troops under Murat had marched across the Pyrenees, and taken possession of the Spanish capital.

The wretched squabbles and recriminations that followed between Charles and his son, and which were encouraged by Napoleon, ended in Ferdinand's renouncing the crown of Spain unconditionally, receiving for himself and his posterity an annual income of 600,000 francs from the crown revenues of France, likewise the palace and parks of Navarre. The château of Valençay, belonging to Prince Talleyrand, was assigned as a residence, to him, with his brother Don Carlos, his uncle Don Antonio, the Canon Escoiquiz, and the Duke of San Carlos. Here his proceedings were watched with the utmost vigilance; and it was not till the end of 1813, when the splendid series of British triumphs in the peninsula had made a longer occupation of the country by the French impossible, that Napoleon offered to reinstate him on the throne of Spain. On Mar. 14 Ferdinand returned to Spain, where he was received with every demonstration of loyalty and affection. Very unfortunately for Spain and for his own comfort, Ferdinand had, in the meantime, learned to associate liberalism with Jacobinism, and both with Bonapartism, so that, on his reaccession to power, he threw himself into the hands of the clergy and the reactionary portion of his nobility. Even before his arrival in Madrid, he refused to swear or accede to the constitution of the cortes, as interfering too much with the free exercise of regal authority, though he promised another in its place. From the moment, however, that he assumed the reins of government, a series of transactions took place which excited the astonishment and disgust of all liberal-minded politicians in Europe. Instead of the promised constitution, there commenced a fearful system of persecution against all suspected of liberal opinions; and executions, imprisonment, exile, and confiscation of property reigned in all parts of the kingdom. The monastic orders, the Inquisition, and the rack were restored, and every expression of opinion rigorously repressed. It is estimated that 20,000 families were compelled to leave their country. At length, 1820, Jan., an insurrection broke out, and Ferdinand was compelled to restore the constitution of the cortes of 1812; but the French government interfering by force of arms, absolutism was restored in Spain 1823. In 1820, Ferdinand married the notorious Maria Christina—his *fourth* spouse. By the first three he had no children. Maria, however bore him two children: Isabella II., the late queen of Spain, and the Infanta Maria Louisa, who married the Duke of Montpensier. By the influence of Maria Christina, Ferdinand was induced to abrogate the Salique law excluding females from the throne, and to restore the old Castilian law of cognate succession. This step led to a dangerous combination among the adherents of the king's brother, Don Carlos, even during the lifetime of the former, and after his death, to a civil war. See Don Carlos: Espartero. In 1833, June 20, the deputies, cortes, and grandees of the kingdom, took the oath of fealty, and did homage to the Princess of the Asturias,

and Ferdinand died Sep. 29. Ferdinand's reign was disastrous to his country. He has been described as the typical Spanish Bourbon—selfish, hypocritical, dissolute, ferocious, imbecile, and religiously savage.

FER'DINAND, *fėr'dĭ-năn̆d*, I. (El Gentil, The Gentleman), King of Portugal: 1345-1383, Oct. 22 (reigned 1367-83); son of Pedro I. of Portugal. He succeeded his father 1367, and two years later on the death of Pedro the Cruel of Castile, claimed the vacant throne as great-grandson of Sancho IV., on the maternal side. The kings of Aragon and Navarre also became claimants, and while the three disputed Henry of Trastamara boldly seized the crown and took the field at the head of the army. The rivals engaged in several indecisive campaigns, and then agreed to submit their respective claims to Pope Gregory XI. A treaty was ratified 1371 which provided for the marriage of Ferdinand and Leonora of Castile, but the former fell in love with the wife of one of his courtiers, Leonora Tellez, procured a dissolution of her marriage and made her his queen. This action led to an insurrection in Portugal and incited the Duke of Lancaster to prevail on Ferdinand to make a secret treaty for the expulsion of Henry from his throne. An unsuccessful war followed, and peace was negotiated 1373. Six years afterward Henry died, and the Duke of Lancaster reasserted his claims to the throne and was sustained by Portugal. Ferdinand signed a treaty of peace at Badajoz 1382, in which it was agreed that his heiress Beatrix should marry John, King of Castile, with the ultimate view of uniting the two crowns. He died at Lisbon without male issue, and the direct Burgundian line which had occupied the throne since about 1112 became extinct. After his death the agreements regarding the succession in the treaty of Badajoz were set aside and Ferdinand's illegitimate brother, John, grandmaster of the order of Aviz, was proclaimed king. This defection led to a war of several years' duration.

FER'DINAND (Augustus Francis Anthony): titular King of Portugal (1837-53), regent (1853-55); b. 1816, Oct. 29; son of Prince Ferdinand of Saxe-Coburg-Gotha. He married the widowed Queen Maria II. of Portugal, 1836 and received the courtesy title of king 1837, Sep. 16. The queen died 1853, Nov. 15, and he became regent of the kingdom during the minority of their eldest son, the late Pedro V., which terminated 1855, Sep. 16. He is a man of wide scholarly and artistic attainments, an accomplished musician and composer, and a skilful painter and engraver. In 1869, June, he married Eliza Hensler, of Boston, Mass., (dau. of a German shoemaker formerly resident in Springfield, Mass.), a remarkably beautiful woman and a charming opera singer, for whom he obtained the title of Countess of Edla, and made his permanent home in Lisbon. He was offered the crown of Spain by marshals Prim and Serrano 1870, but declined it. Ferdinand's second son, Louis I., succeeded to the throne 1861, Nov. 11; died 1889, Oct. 19; and was succeeded by his son, Carlos I.

FER'DINAND I., King of the Two Sicilies: 1751, Jan. 12—1825, Jan. 4 (reigned 1759-1825, with interregnum 1806-15); son of Charles III. of Spain. When Charles ascended the Spanish throne, 1759, Ferdinand, though a minor, succeeded him on that of Naples under a regency. After his marriage, 1768, with Maria Carolina, daughter of Empress Maria Theresa, he fell completely under her influence, and lost all his former popularity. The queen and her favorite minister Acton (q.v.) ruled the kingdom. Ferdinand joined England and Austria against France 1793, but 1801 was forced to enter into a treaty with the First Consul. A subsequent violation of this treaty compelled him, 1806, to take refuge in Sicily, under the protection of the English. A French army marched into Naples, and took possession of the kingdom, which Napoleon bestowed first on his brother Joseph, and afterward on Murat. Ferdinand was reinstated by the congress of Vienna, and entered Naples, after Murat's flight, 1815, June. His queen had died 1814. During the revolution of 1820, he was obliged to introduce the Spanish constitution of 1812, but abolished it next year with the help of Austrian arms. He, however, expelled the Jesuits, and abolished superfluous convents; acts that may, perhaps, partly atone for his bloody persecution of the republicans 1800, and his general antipathy to enlightened principles of government. He was succeeded by his son Francis I., who died 1830.

FER'DINAND II., King of the Two Sicilies: 1810, Jan. 12—1859, May 22 (reigned 1830-59); son of Francis I. by his second wife, Isabella Maria of Spain. The country was in most wretched condition; and all eyes were turned to the young king, the beginning of whose reign was marked by various acts of clemency toward political enemies, and by the introduction of reforms in the economy and government of the country. But it was not long before he began to listen to foreign counsels, which saw danger for the whole peninsula in liberal measures. From that time, Naples became the scene of incessant conspiracy, insurrection, bloodshed, and political prosecutions. Ferdinand yielded to the storm of 1848, and granted a constitution to both parts of his dominions; he was even obliged to take part in the war against Austria in n. Italy. The Sicilians mistrusted, and with reason, the king's proceedings, and declared that he and his family had forfeited the Sicilian crown. Ferdinand followed the constitution so far as to call the chambers together, but quickly dismissed them, impatient of any interference with his authority. After the subjugation of Sicily 1849, when the reaction began to set in all over Italy, he hastened completely to set aside the new constitution; while all who had taken any part in state reforms were subjected to those cruel persecutions that the Letters of Mr. Gladstone have held up to the execration of the world. Ferdinand was succeeded by his son Francis II.

FER'DINAND III., Grand Duke of Tuscany, Archduke of Austria: 1769, May 6—1824, June 18 (ruled 1790-1824, with interregnum 1799-1814); b. Florence; son of Leopold II., whom he succeeded in the government of Tuscany, when Leopold obtained the imperial throne at the death of Emperor Joseph II., Leopold's brother. Ferdinand's rule in Tuscany was one of combined mildness and ability; and during his reign were inaugurated many judicial, economical, and legislative reforms: commerce was protected and encouraged; hospitals and asylums founded, good roads opened through the state, and the greatest attention bestowed on the welfare of his subjects. A lover of peaceful progress, he remained strictly neutral in the first coalition against France, and was the first sovereign in Europe to recognize and treat diplomatically with the French Republic, 1792. In 1793, intimidated by the combined menaces of the Russian and British cabinets, Ferdinand was constrained to relinquish his neutral policy, and become a passive member of the coalition formed by the above governments against France. In 1795, on the French occupation of Piedmont, he speedily reassumed friendly relations with France. In 1797, to save his states from annexation to the Cisalpine Republic, Ferdinand concluded a treaty with Bonaparte on most unfavorable terms; undertaking to pay a war-levy to France, and to transfer to the Museum of Paris some of the chief masterpieces of the Florentine galleries, including the *Venus de' Medici*. Owing to the continued intrigues of France in his states, Ferdinand was forced to seek an Austrian alliance, which furnished Bonaparte with a pretext for declaring war simultaneously against Austria and Tuscany. In 1799, Ferdinand retired to Vienna, leaving the French troops in occupation of Tuscany. In 1801, at the place of Lunéville, he was forced to renounce all claim on Tuscany. In 1814, the peace of Paris reinstated him in Tuscany, and even restored his artistic treasures. This just and enlightened prince at his death left his states to his son Leopold III.

FERDINAND, Duke of Brunswick: 1721, Jan. 11—1792, July 3; fourth son of Duke Ferdinand Albert of B.: famous general. He received a thorough military education, entered the Prussian service at an early age, distinguished himself as col. in the first and second Silesian wars, and was given command of a division at the beginning of the seven years' war. Shortly after the memorable victory at Prague 1757, to which he contributed largely, George II. of England appointed him to the supreme command of the allied forces, with which he held both the imperial army and several subordinate French ones at bay for five years, notwithstanding his opponents were more numerous and better organized and officered than his own troops. During this period he gained a notable victory over the French under Marshal Contades at Minden, 1759, Aug. 1. An irreconcilable estrangement occurred between Ferdinand and Frederick the Great 1766.

which resulted in the former retiring wholly from military service. He retired to his duchy, built the castle of Veschelde, and spent the remainder of his life in promoting educational and artistic enterprises, and in helping the poor.

FERETORY, n. *fĕr'ĕ-ter-ĭ* [L. *fĕrētrŭm*, a bier—from *fero*, I bear: It. *feretro*]: the bier or shrine containing the relics of saints, borne in processions; the place in a church where the bier is set.

FERGHANA, *fĕr-gâ'nâ:* Russian province of central Asia, formerly the khanate of Khokan (q.v.). Ferghana is an anc. name of the city of Khokan, now the chief town of the province. Ferghana is surrounded on three sides by the w. ranges of the Thian Shan Mountains, and its climate is generally healthful. One-third of the people are nomads. Pop. 1,560,411.

FERGUS FALLS: a city and cap. of Otter Tail co., Minn., on the Red river of the North, and on the Northern Pacific and Great Northern railroads; 187 m. n. w. of St. Paul. It is situated in the heart of the park section of the state; is the seat of the Norwegian Lutheran College; and has large woolen and flour mills. Pop. (1900) 6,072. (1910) 6,887.

FERGUSON, *fer'gŭ-son*, ADAM: Scottish philosopher and historian: 1724-1816, Feb. 22; b. Logierait, in Perthshire, Scotland, where his father was parish minister. He studied at the universities of St. Andrews and Edinburgh, and was appointed (1744) chaplain to the 42d regt., in which capacity he was in the battle of Fontenoy, and is said to have charged the enemy sword in hand, among the foremost of his regiment. In 1757, he succeeded David Hume as keeper of the Advocates' Library in Edinburgh. He was appointed prof. in the Edinburgh Univ., first of natural philosophy 1759, and of moral philosophy 1764. In 1778-9 he acted as sec. to the commission sent out by Lord North to try to arrange the disputes with the N. American colonies. The state of his health induced him, 1784, to resign his professorship, in which he was succeeded by Dugald Stewart. He died in St. Andrews. His chief works are—*Essay on the History of Civil Society* (Lond. 1767) *Institutes of Moral Philosophy* (Lond. 1769), *History of the Progress and Termination of the Roman Republic* (Lond. 1783), and *Principles of Moral and Political Science* (Lond. 1792). The work by which he is best known is his *History of the Roman Republic;* this, with the Essay and Institutes, have gone through a number of editions. All his works have been translated into German and French, and the Institutes has been used as a text-book in several universities. In these last he argues that since man is by nature a member of society, that both his self interest and his real perfection consist in his making himself as worthy a member of society as possible.

FERGUSON, *fėr'gŭ-son*, JAMES: 1710-76: b. near Keith

a village in Banffshire, Scotland. His father being a poor day-laborer, he had only three months of instruction at school. His tastes were for practical mechanics and astronomy; and while keeping sheep, to which he was early sent, he was constantly employed in making models of mills, etc., and at night in studying the stars. After working at various country employments, he took to drawing patterns for ladies' dresses, and copying pictures and prints with pen and ink. He then supported himself and his parents by drawing portraits, first in Edinburgh, afterward (1743) in London; his leisure time being all the while given to astronomical pursuits. In 1748, he began lecturing with great acceptance on astronomy and mechanics. He was elected a fellow of the Royal Soc. 1763, and received from George III. a pension of £50. His principal works are—*Astronomy Explained upon Sir Isaac Newton's Principles* (1756; Sir David Brewster's ed. 2 vols. 1811); and *Lectures on Mechanics, Hydrostatics, Pneumatics, and Optics* (1760; also edited by Brewster 1805). See his Life by Dr. E. Henderson, with Autobiography (2d ed. 1870).

FERGUSON, James: 1797, Aug. 31—1867, Sep. 26; b. Perthshire, Scotland: engineer and astronomer. He came to the United States 1800: studied civil engineering and surveying, and was employed as asst. engineer on the Erie canal 1817-19, asst. surveyor on the boundary commission under the treaty of Ghent, 1819-22, astronomical surveyor on the same commission 1822-27, civil engineer for the state of Penn. 1827-32, first asst. of the U. S. coast survey 1833-47, and asst. astronomer of the U. S. naval observatory 1847-67. He discovered the asteroids *Euphrosyne* (1854), *Virginia* (1857), and *Echo* (1860), for which he received the astronomical prize medals of the French Acad. of Sciences, 1854, 60.

FERGUSON, Samuel David, d.d.: Prot. Episc. bishop of W. Africa: b. Charleston, S. C., 1842, Jan. 1. When 6 years old he removed with his parents to the republic of Liberia, Africa, and was educated in the mission schools established there by the Prot. Episc. Church. He became a teacher 1862, deacon 1865, priest 1868, and missionary bishop for W. Africa 1885. He was consecrated in New York 1885, June 24, and directly afterward returned to his station at Cape Palmas. For 20 years prior to his consecration, he had been an active promoter of the missionary and educational interests of his church.

FERGUSSON, Arthur Walsh, American linguist: b. Benicia, Solano county, Cal., 1859, Dec. 4. He was graduated at St. Augustine College, Benicia, in 1877, and at the Georgetown University Law School in 1885. He first came into public notice in 1889 when made official interpreter of the American conference at Washington. Subsequently he was secretary of the International American Moetary Commission in 1891; official interpreter of the Intercontinental Railroad Commission in the same year; secretary of the United States Chilean Claims Commission

in 1893; secretary of the United States and Venezuelan Claims Commission in 1894; chief translator of the Bureau of American Republics in 1897; official interpreter of the American and Spanish Peace Commission at Paris in 1898; and Spanish secretary of the United States Philippine Commission in 1900. Chief sec. to Commission 1901; Vice-pres. University Club, Manila.

FERGUSSON, *fėr'gŭs-son*, JAMES, D.C.L., F.R.S., LL.D.: 1808-1886, Jan. 9; b. Ayr, Scotland: architect, and eminent writer on architecture. He was educated in Edinburgh and London, spent several years in mercantile business in India, and then applied himself to studying the various styles of architecture in eastern countries. He published the results of his researches with many illustrations in *Illustrations of the Rockcut Temples of India* (1845); *Picturesque Illustration of Ancient Architecture in Hindostan* (1847); *Handbook of Architecture* (1855); *Essay on a Proposed New System of Fortification by Earthworks* (1849); *The Palaces of Nineveh and Persepolis Restored* (1851); *History of the Modern Styles of Architecture* (1862); *History of Ancient and Modern Architecture*, 3 vols. (1868), and *Temples of the Jews and the Other Buildings in the Haram Area at Jerusalem* (1878). He was architect of the Nineveh Court in the Crystal Palace at Sydenham, received the royal gold medal of the Royal Institute of British Architects 1871, Apr. 17, and was given the degree LL.D. by the Univ. of Edinburgh 1878, Aug. His *History of Ancient and Modern Architecture* is one of the most complete and valuable works in that department.

FERGUSSON, ROBERT: Scottish poet: 1751, Oct. 17—1774, Oct. 16; b. Edinburgh. He received his education at the Univ. of St. Andrews, removed to Edinburgh, and was employed in the office of the commissary clerk. His poems were chiefly contributed to *Ruddiman's Weekly Magazine*, and gained considerable local reputation, which proved his ruin. His society was eagerly sought; and in that convivial time, he was led into excesses. He fell into a religious melancholy, and finally, through an accidental fracture of the skull, became totally deranged. His poems published 1773, show mastery over Lowland Scotch. To some extent the forerunner of Burns, who admired his works.

FERIAL, a. *fē-rĭ-ăl* [L. *fĕrĭæ*, holidays, festivals]: pertaining to holidays. FERIÆ, in anc. Rome, holidays during which political and legal transactions were suspended, and slaves enjoyed cessation from labor. Feriæ were thus *dies nefasti*, opposite of the *dies fasti:* see FASTI. Days consecrated to a particular divinity, on which any public ceremony was celebrated, and the like, were feriæ. In distinction from these which were *feriæ publicæ* (public holidays) there were *feriæ privatæ*, observed by single families in commemoration of some important event in their annals. Birthdays, days of purification after a funeral, etc., also were observed as family feriæ. The

public feriæ were divided into those always kept (*stativæ*) on certain days marked in the calendar; and those which were kept by command of the consuls or other superior magistrates on any public emergency. On all public feriæ the people generally visited the temples of the gods, and offered prayers and sacrifices. The most serious and solemn seem to have been the *feriæ imperativæ;* all the others were generally attended by rejoicings and feasting. See an elaborate article by Dr. Schmitz in Smith's *Dictionary of Greek and Roman Antiquities.*

FERID-EDDIN-ATHAR, *fĕh-rēd′ĕd-dĕn′ á-târ′* or FARID-UDDIN-ATTAR, 1119-1229; b. Kedken, Persia: poet and mystic. His real name was Muhammed ben Ibrahhim, Ferid Eddin being an honorable title equivalent to 'Pearl of Religion'. He was a druggist or perfumer by trade. Early in life he became interested in the mystery of man's higher life, and abandoning his business, began studying the theosophy of the Sufis under Sheikh Rekenuddin. He entered into the spirit of that religion with so much earnestness, that he was before long recognized as one of its principal representatives, and after making the pilgrimage to Mecca was invested with the Sufi mantle by Sheikh Majduddin of Bagdad. He was a voluminous writer, and left about 120,000 couplets of poetry, doubtless written in early and middle life, as in his later years he carried his asceticism so far as to deny himself the pleasures of composition. His chief work was the *Mantic Uttair,* or language of birds, the text of which was published by Garcin de Tassy, the Orientalist, 1857.

FERINGEE, n. *fĕr-ĭng′gē,* but properly FURUNGEE, n. *fŭr-ŭng′gē,* or FARANGI, n. *făr-ăng′gē,* [Pers. *Farang,* Europe: comp. F. *franc,* free, a Frank]: in the *East,* a Frank; a European or white man: ADJ. European; usually applied by natives to the Portuguese and other mixed races as a contemptuous name.

FERIO, n. *fē′rĭ-ō,* or *fā′rĭ-ō* (a word without etymological meaning but designed to have its letters symbolic): in logic the fourth mode of the first figure of syllogisms. See SYLLOGISM and MOOD in logic.

FERISON, n. *fē′rĭ-sŭn* (a word without etymological meaning but designed to have its letters symbolic): in logic the sixth mode of the third figure of syllogisms. See SYLLOGISM and MOOD in logic.

FERLIE, or FERLY, n. *fėr′lĭ,* also FARLIE, n. *fār′lĭ* [AS. *faerlic,* sudden, fortuitous: Icel. *ferligr,* strange]: in *Scot.* and *prov. Eng.,* a wonder; a strange thing.

FERM, n. *fērm* [AS. *feorm,* food, board, entertainment —from AS. *feorh;* Icel. *fjör,* life]: in *OE.,* a farm, rent for a farm; an abode; a dwelling.

FERMANAGH, *fėr-măn′a:* inland county in the s.w. of the province of Ulster, Ireland; 45 m. long, 29 broad; 714 sq. m., $\frac{3}{5}$ arable, $\frac{1}{76}$ in wood, and more than $\frac{1}{9}$ in water, including Upper and Lower Lough Erne, and the smaller

lakes, Melvin and Macnean. The surface is mostly a succession of mountains and hills, and the scenery varies. The chief rocks are limestone, with many cavities and underground water-courses, millstone grit, and old red sandstone. Some coal, iron, and marble occur. The chief rivers are the Erne and its tributaries, the Colebrooke, Woodford, and Arney. The soil in the low grounds is a deep rich loam, but in the limestone and sandstone districts it is cold and thin. The climate is mild and moist. Marsh-fever prevails in summer and autumn near Lough Erne. Oats, barley, wheat, potatoes, turnips, and hay are the chief products. The chief exports are oats, butter, and eggs. Fermanagh is divided into 8 baronies and 23 parishes. It returns 2 members to parliament. Principal towns: Enniskillen, Lisnaskea, and Lowtherstown. A little coarse linen is manufactured in the county. The chief antiquities are raths or rude hill-forts, and some ecclesiastical ruins. Pop. (1901) 65,430.

FERMAT, *fĕr-mâ′*, Pierre de: 1590-1665; b. Toulouse: French mathematician. At an early period, with his friend Pascal, he hit upon a very ingenious mode of considering figurate numbers, upon which he subsequently based his doctrine of the calculation of probabilities. Fermat gave much study to the properties of numbers, and made many acute discoveries in regard to their composition and analysis. He also squared the parabola in a much simpler way than Archimedes had done, and made many other discoveries in geometry. His method of finding the greatest and least ordinates of curved lines was analogous to the method of the then unknown differential calculus. In addition to his scientific attainments, Fermat had extraordinary knowledge of ancient and modern languages. He died at Toulouse. A collection of his works appeared at Paris, 1679.

FERMATA, *fĕr-mâ′-tâ*, in Music: pause or resting-point, generally marked by the sign ⌒. The notes over which this sign is placed are prolonged beyond their true length. The Fermata is frequently found near the end of a part of a composition, which affords an opportunity for the singer or player to introduce an extempore embellishment.

FERMENT, v. *fėr-mĕnt′* [F. *ferment*—from L. *fermen′tum*, leaven—from *fervĕō*, I boil: It. *fermento*]: to cause to rise or swell by yeast, as dough; to cause to rise to froth by the addition of yeast; to effervesce; to produce a chemical change by some obscure agent which is not itself altered in the process—e.g., the change of sugar into alcohol, and alcohol into vinegar, by the alcoholic and acetic ferments respectively. Ferment, n. *fėr′mĕnt*, that which possesses the power of inducing fermentation—frequently a microscopic fungus; agitation; tumult; intestine motion. Ferment′ing, imp.: Adj. working; effervescing. Ferment′ed, pp.: Adj. having undergone the process of fermentation. Fermen′table, a. *-mĕn′tă-bl*, capable of being fermented. Fermen′tabil′ity, n. *-bĭl′ĭ-tĭ*. Fer′menta′tion, n. *-tā′shŭn* [F.—L.]: a working or

frothing up of any substance under the influence of warmth, air, and moisture; an internal motion caused by decomposition; the process of converting the juice of the grape into wine, or the liquid extract of malt into an alcoholic liquor, as beer. FERMEN'TATIVE, a. *-tă-tĭv*, tending to cause fermentation. FERMEN'TATIVENESS, n. VINOUS FERMENTATION, that fermentation in which sugar is converted into carbonic acid and alcohol. FERMENT-OILS, n. in *chem.*, volatile oils produced by the fermentation of various plants, not originally contained therein, and different from the oils which are extracted from the unfermented plants by distillation with water. They were known to the alchemists, and by them designated quintessences. Ferment-oils are for the most part more soluble in water than ordinary volatile oils. They are generally formed by allowing the flowering plant to ferment in water; the liquid is distilled when the fermentation is ended, and the oil extracted from the distillate by slaking it with ether, which dissolves the oil; the ether is then allowed to evaporate.

FERMENTATION: a term indicating the changes whereby in the presence of a body called a ferment, many organic compounds, notably the Carbohydrates, are decomposed into simpler compounds, although not necessarily into the ultimate products of decomposition. The substances which seem to effect these changes may be either soluble unorganized ferments, or insoluble organized ferments which are, in fact, minute vegetable growths, belonging to a very low type of vegetable life known as fungi. Considering the organized ferments first, it should be remarked that they are divided into three classes, as follows: (1) Mould growths; (2) Yeast plants, or the different species and varieties of saccharomyces; (3) Bacteria, or Schizomycetes.

Mould (or mold), a word of well-known application, signifies the minute fungus growth commonly appearing on moist articles of food, decaying wood, walls of damp cellars and other similar places, etc., forming greenish, bluish or gray patches of vegetation, and emitting a sour and musty smell. It is capable of producing chemical changes in many organic substances, but as a general thing, is of little consequence, except as it may contaminate and interfere with other fermentative operations with which it is frequently associated.

The term Saccharomyces, derived from two Greek words, signifies the sugar fungi, including the several species of yeasts, which produce the so-called alcoholic fermentation, by which several of the monosaccharides or simple sugars are transformed into alcohol and carbon dioxide. The word schizomycetes may be translated fission or splitting-fungi; bacteria (plural of bacterium, meaning a little rod), schizomycetes, splitting ferments, are miscroscopic plants of the lowest order, forming rods, or spiral, threadlike or rounded cells, propagating by fission with astonishing rapidity, if conditions are fav-

orable; they may, however, sometimes develop spores, which, scattered everywhere, find ready access to liquids and moist substances exposed to the air. They cause decomposition and often putrefaction, in many bodies containing albuminous or nitrogenous material, and the products of these reactions are often extremely poisonous. Some of these cause acute diseases in man and animals. The production of nitrates (nitrification) is attributed to the action of bacteria.

The soluble unorganized ferments are called, according to Kuhne, *Enzymes* (Gr. en, in, and *zumē*, leaven); as examples, may be mentioned: diastase, present in malt, and efficient in changing starch into dextrin and maltose (a fermentable sugar); ptyalin, found in the saliva and like diastase, active upon starch, forming dextrins and sugar; pepsin, a constituent of the gastric juice, transforming the proteids of the food into soluble peptones; and tryprin, amylopsin and steapsin, found in the pancreatic secretion, and specially adapted to the digestion of proteids, starches and fats, respectively.

It is easily seen, from the above enumeration, how important is the role played by enzymes in the animal body in connection with digestion.

The earlier views with regard to fermentation held that it was referable directly to the life processes of the organized ferment; when therefore the action of enzymes was acknowledged, the distinction was insisted upon (and is still used), between true fermentation and the enzymotic processes. Thus it is said that the splitting of invert sugar into alcohol and carbon dioxide, closely connected with the life of the yeast plant, is a fermentative process; while the inversion of cane sugar is an enzymotic process, caused by a body formed by the living ferment, which can be separated from the ferment and continue its activity even after the death of the ferment.

The above view has been somewhat shaken by the researches of E. Buchner, who has been able to obtain from beer-yeast, by grinding and strong pressure, a fluid rich in proteid which when introduced into a solution of fermentable sugar, caused a violent fermentation. According to Buchner, alcoholic fermentation is not directly connected with organized structure and the processes of life, but is produced by soluble products secreted by the cells, and separable from them.

The character of enzymotic, and likewise of all fermentation operations, seems to be the reduction of complicated compounds to simpler forms—the substitution of a stable for an unstable chemical equilibrium—in form the reaction is generally, hydrolytic cleavage; new compounds are formed with lower heats of combustion—chemical tension is transformed into living force.

Enzymes are nitrogenous bodies, and are quite similar to proteids; the successful isolation of an enzyme in a pure state is doubtful. The solvents of enzymes are water and glycerol; alcohol precipitates them from

solution. Each enzyme has its specific action, which is greatly influenced by the reaction (acid, alkaline or neutral) of the liquid, and the temperature, and shows great similarity to the so-called catalytic or contact actions of chemistry.

FERMENT'ED LIQ'UORS: alcoholic beverages made by fermentation of saccharine fluids and juices; the principal being the different kinds of *ale* or *beer*, made by fermentation of an infusion of malt, chiefly of barley, but sometimes of other kinds of grain; and *wine*, made by fermentation of grape-juice. *Cider* is made by fermentation of the juice of apples; *perry*, of that of pears; *palm-wine*, by fermentation of the sap of different kinds of palm. Fermented liquors, commonly called wines, are made also from the juice of various kinds of fruit, as currant wine from that of the red currant; and from the juice of some roots, etc. The sap of the American Aloe, or *Agave* (q.v.), yields the fermented liquor called *Pulque*, much used in Mexico. A wine is made from the sap of the birch, and that of some other trees is used for a similar purpose. *Mead* is a fermented liquor made from honey. From every fermented liquor a kind of *spirit* may be obtained by distillation: see BEER: SPIRIT: WINE.

FERMO, *fĕr'mō:* town of Italy, province Ascoli Piceno, on a rocky height 4 m. from the Adriatic, 32 m. s.s.e. of Ancona. It is well-built and fortified, surrounded with walls and ditches, is the seat of an archbishop, and has a cathedral and an elegant theatre. It has some trade in corn and wool. In the immediate vicinity are the ruins of the ancient Firmum, whose name Fermo inherits. Firmum had been a Roman colony from B.C. 264. Pop. (1901) 20,542.

FERMOY, *fėr-moy':* town in the e. of Cork county, Ireland, chiefly on the right bank of the Blackwater, 19 m. n.e. of Cork city. Its origin dates from the 12th c., when it was the seat of a great Cistercian abbey; but its present importance dates from the end of last century. The hills of the town rise in Knockinskeagh 1,388 ft. Fermoy is handsomely built and regularly laid out. A large ecclesiastical establishment (Rom. Cath.), consisting of a church, a bishop's house, two convents with large schools, and a college with nearly 100 students, has recently been erected on a hill rising from the Blackwater. A bridge of 13 arches, built 1689, crosses the river. Infantry and cavalry barracks for 3,000 men stand on the left bank of the river, and command the approach to Cork. Fermoy has a trade in agricultural produce. Pop. 6,454.

FERN, n. *fėrn* [AS. *fearn*, fern: Sw. *fara*, to go—applied to events produced by diabolic art: AS. *fær death*, sudden death]: a family of cryptogamic plants, usually with broad feathery leaves or fronds—probably so named from the reputed use of their seeds in magical incantations (see FERNS). FERNY, a. *fėrn'ĭ*, abounding in ferns. FERNERY, n. *fėrn'ėr-ĭ*, a place where ferns are grown or cultivated.

MALE FERN, name given, in consequence of an erroneous notion, long since exploded, to a fern very common in the woods of Britain and of the continent of Europe, the *Aspidium filix mas* of some botanists, and *Lastræa filix mas* and *Nephrodium filix mas* of other. The fronds are bipinnate; the pinnules oblong, obtuse, and serrated; the sori near the central nerve, orbicular, kidney-shaped, and fixed by the sinus; the stripes and rachis chaffy. It is a chief ornament of many forests, and a plant of considerable beauty. The subterranean stem (rhizome) is officinal. It is about 12 inches long, and of the thickness of a quill, almost inodorous, with a nauseous sweet taste, becoming astringent and bitter. It was anciently used as an anthelmintic, and its use has been revived, especially in cases of tapeworm, in which it is believed to be very efficacious. Its anthelmintic powers are due to a thick, almost black, volatile oil which it contains, and which also is now used in medicine. SWEET FERN (*Comptonia asplenifolia*), shrub of the nat. ord. *Amentaceæ*, suborder *Myriceæ*, native of the mountain woods of N. America, forming a small bush with linear pinnatifid, fern-like leaves. Its leaves have a powerful aromatic, fragrance when rubbbed. It is tonic and astringent, and is used in the United States as a domestic remedy for diarrhea.

FERN, FANNY: See PARTON, JAMES.

FERNALD, *fėr'nald*, JAMES CHAMPLAN: Baptist clergyman, author, and encyclopedist: b. Portland, Me., 1838, Aug. 18. He was graduated at Harvard College, 1860, taking the first Bowdoin prize for English composition; and subsequently entering Newton Theological Seminary he was graduated thence, 1863. The following year he was ordained to the Baptist ministry, and going to Ohio served as pastor at Granville, Springfield and other places until 1889, when he returned to New York. Since then he has been engaged in literary work, and has edited Synonyms, Antonyms, and Prepositions in the *Standard Dictionary;* served as editor-in-chief of the *Students' Standard Dictionary*, and other abridgments of the same work. He was for a time editor of the *Homiletic Review*, and associate editor of the *Columbian Encyclopedia*. In 1904 the Denison University gave him the degree of L.H.D. His publications include, *The Economics of Prohibition* (1890); *The New Womanhood* (1894); *Synonyms, Antonyms, and Prepositions of the English Language* (1895); *The Spaniard in History* (1898); *The Imperial Republic* (1898); *Home Training of Children* (1898); *The Classic Speller* (1899); *True Motherhood* (1900); *Scientific Side-Lights* (1901); *Connectives of English Speech* (1904).

FERNANDEZ, *fėr-năn'dĕz*, JUAN: Spanish navigator and discoverer. In 1563 he discovered the two islands which bear his name, and solicited the concession of them from the govt. on account of their beauty and fertility.

His petition was granted 1572, and he planted a short-lived colony on the largest island. Alexander Selkirk's adventures on this island are supposed to have formed the basis of De Foe's *Robinson Crusoe.* In 1574 Fernandez discovered the islands of St. Felix and St. Ambrose, and his surviving companions affirmed that during a voyage in the s. ocean 1576, he came in sight of a continent which must have been either Australia or New Zealand if the discovery is to be taken as a fact.

FERNANDINA, *fėr-nân-dē'na:* city, cap. of Nassau Co., Fla.; on Amelia Island, bet. Nassau and Prince William Sounds, separated from the main land by a channel known as Amelia river; 28 m. n.n.e. of Jacksonville, 36 m. s. of Brunswick, Ga.; n.e. terminus of the Atlantic Gulf and W. India Transit railroad. It is a port of entry and has a deep, commodious, and safe harbor, the entrance of which is marked by a light-house and Fort Clinch. The industries comprise the manufacture of lumber, sash, blinds, and cotton-seed oil, and foreign and coastwise trade in cotton and naval stores. It contains a court-house, 5 white and 4 colored churches, a Rom. Cath. acad., private bank, weekly newspaper; is the seat of the Prot. Episc. bp. of Fla.; and is a popular summer and winter resort with tri-weekly steamboat connection with Charleston and Savannah. Pop. (1910) 3,482.

FERNANDO PO, *fėr-nan'dō pō:* island on the w. coast of Africa, in the Bight of Biafra, about 20 m. from the nearest point on the shore; about 44 m. long, 20 m. broad. The appearance of this island from the sea is exceedingly picturesque and beautiful. It is traversed by a mountain-ridge, which, in Clarence Peak, rises to the height of 10,650 ft., and is fertile, well-watered, and in many parts thickly wooded. Besides swarms of monkeys, some of great size, the island contains many goats and sheep in a state of nature. The climate, always excessively hot, is rendered intolerable, during the rainy season, by a pestilential wind from the continent. The native population are of negro race, and are said to inhabit 15 villages. The English, with the consent of Spain into whose hands Fernando Po had fallen, made an attempt 1827 to form a settlement on the island, but abandoned it 1834. In 1844, it was again taken possession of by Spain. Pop. (1900) 20,741.

FERNAN-NUNEZ, *fĕr-nân'nôn'yĕth:* small town of Spain, province of Cordova, 10 m. s. of the town of Cordova. It has some linen and woolen manufactures. Pop. 5,500.

FERNOW, Bernhard Edward: an American scientist; b. 1851, Jan. 7. in Inowraclaw, Germany; came to the United States in 1876, and engaged in metallurgical work; was chief of the Division of Forestry in the U. S. Department of Agriculture, 1886–98; and was made director and dean of the New York State College of Forestry at Cornell University in the latter year. He was author of numerous reports, bulletins and addresses.

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